EMBER, 1958

RUBBER WORLD

SERVING THE RUBBER INDUSTRY SINCE 1889

nts, page 168

of the Five First
ers of the Rubber
e Hall of Fame
shed in October
on University

8)

CHARLES GOODYEAR
1800-1860

CARL O. WEBER
1860-1905

HENRI BOUASSE
1866-1953

IVAN I. OSTROMISLENSKY
1880-1939

ODD ELECTRONS IN RUBBER
REINFORCING CARBON BLACKS

By G. Kraus and R. L. Collins, page 219

LL BROTHERS
LICATION

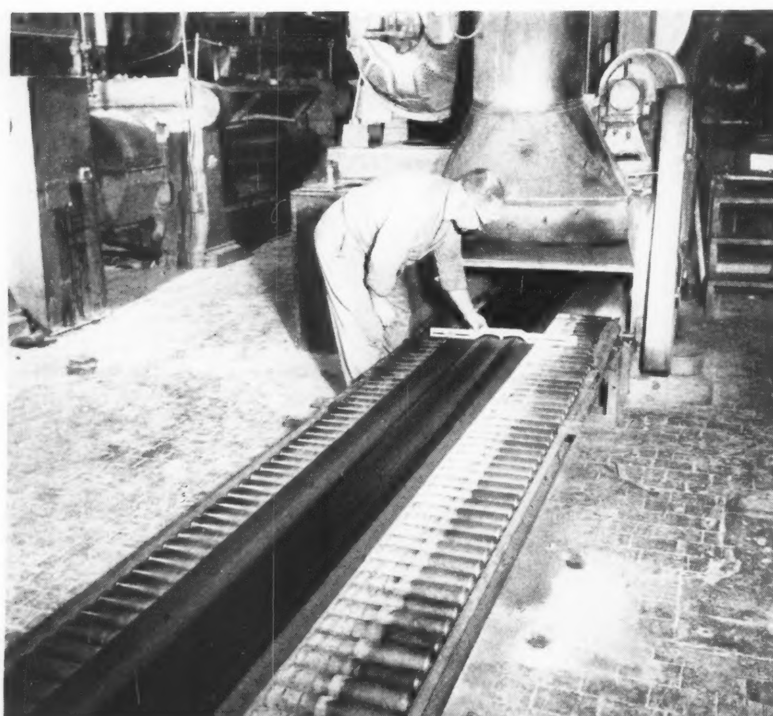
smoother, more uniform extruding stocks...at a marked saving in power requirements...with Du Pont

RPA #6

A CHEMICAL PEPTIZER FOR NATURAL RUBBER AND SBR

- Reduces breakdown and mixing time
- Cuts power requirements
- Improves processing—gives smoother, more uniform compounds

RPA #6 is an easily-dispersed powder that can be used with either Banbury or open mill. It peptizes SBR and natural rubber over a wide range of temperatures, and will not affect the cure rate or physical properties of your vulcanizates.



Smooth, uniform tread extrusions like this are obtained with the help of Du Pont RPA #6. This chemical peptizer keeps the stock more uniform from batch-to-batch . . . means less variation in the extruded tread.

OTHER DU PONT RUBBER PEPTIZING AGENTS

ENDOR
RPA #2
RPA #3
RPA #3 (concentrated)
RR 10

DU PONT
REG. U. S. PAT. OFF.

RUBBER CHEMICALS

Elastomer Chemicals Department
Wilmington 98, Delaware

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Rubber World, November, 1958, Vol. 139, No. 2. Published monthly by Bill Brothers Publishing Corp. Office of Publication, 3rd & Hunting Park Ave. Philadelphia 40, Pa., with Editorial and Executive Offices at 630 Third Avenue, New York 17, N. Y., U. S. A. Second Class Postage Paid at Philadelphia, Pa. under the act of March 3, 1879. Subscription United States $5.00 per year; Canada $6.00; All other countries $7.00. Single copies 50¢. Address Mail to N. Y. Office. Copyright November, 1958, by Bill Brothers Publishing Corp.

RUBBER WORLD

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VOLUME 139, NUMBER 2 NOVEMBER, 1958

CONTENTS

Cover: Goodyear and Ostromislensky, RUBBER WORLD files; other photos, University of Akron

The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

Philblack* E is top of the class!

When Philblack E graduates from the nation's largest furnace black plant at Borger, Texas, he has passed a series of comprehensive examinations for uniformity, for outstanding performance in finished stock, tensile strength and abrasion resistance. And he stands at the top of the class in these important qualities.

Philblack E is the best-wearing black available. This remarkable super abrasion black easily solves difficult tire problems with its superb qualities. Ask your Phillips technical representative for more information about Philblack E.

*A trademark

LET ALL THE PHILBLACKS WORK FOR YOU!

A — **Philblack A, Fast Extrusion Furnace Black.** Excellent tubing, molding, calendering, finish! Mixes easily. Disperses heat. Non-staining.

O — **Philblack O, High Abrasion Furnace Black.** For long, durable life. Good conductivity. Excellent flex life and hot tensile. Easy processing.

I — **Philblack I, Intermediate Super Abrasion Furnace Black.** Superior abrasion. More tread miles at moderate cost.

E — **Philblack E, Super Abrasion Furnace Black.** Toughest black yet! Extreme resistance to abrasion.

PHILLIPS CHEMICAL COMPANY, Rubber Chemicals Division, 318 Water Street, Akron 8, Ohio • **District Offices:** Chicago, Dallas, Providence and Trenton • **West Coast:** Harwick Standard Chemical Company, Los Angeles, California • **Warehouse Stocks** at Akron, Chicago, Trenton, Brighton, Mass. and Toronto, Canada • **Export Sales:** 80 Broadway, New York 5, New York • **European Sales Office:** Limmatquai 70, Zurich 1, Switzerland.

ounding

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is new
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TURING
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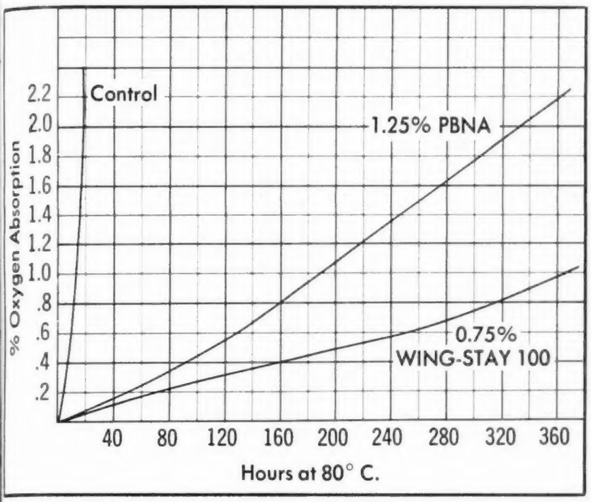
VORLD

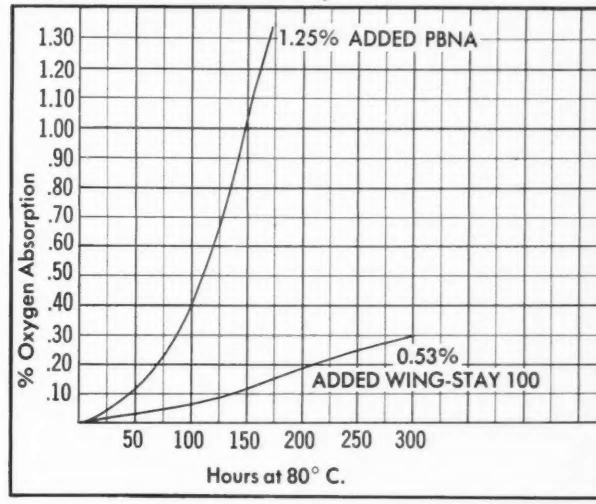
Here's the proof...

Here's graphic evidence of the greater effectiveness of WING-STAY 100 as either a basic stabilizer or an additive:

Effect of WING-STAY 100 on the stability of an Oil-Extended SBR Polymer.

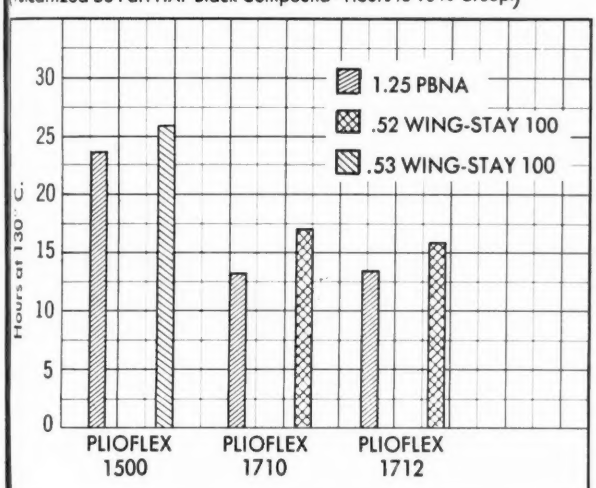


Effect of WING-STAY 100 as added stabilizer in a "cold" nonextended SBR Polymer.



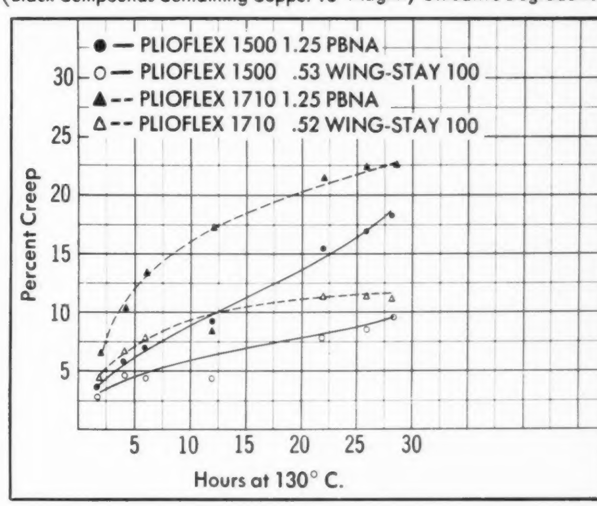
Creep Test on PLIOFLEX Polymers.*

(Vulcanized 50 Part HAF Black Compound • Hours to 10% Creep.)



Creep Test on PLIOFLEX Polymers.

(Black Compounds Containing Copper To Magnify Oxidative Degradation)



measurement of oxidative degradation of rubber in air at elevated temperatures.

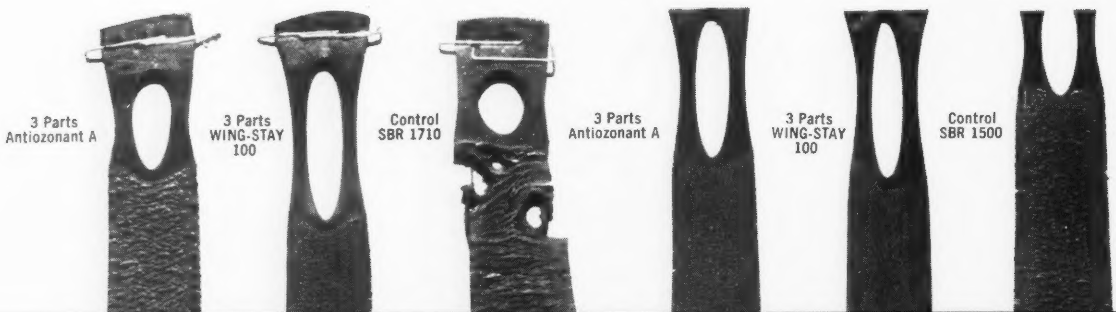
DYEAR

ADIVISION

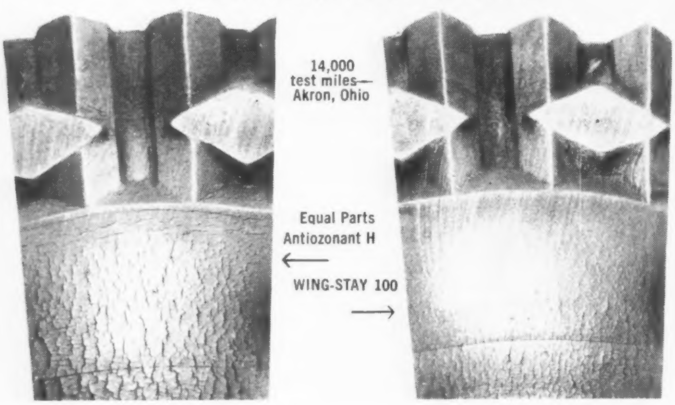
But that's not all...

These actual photographs are further evidence of the superior activity of WING-STAY 100 as an antioxidant and antiozonant:

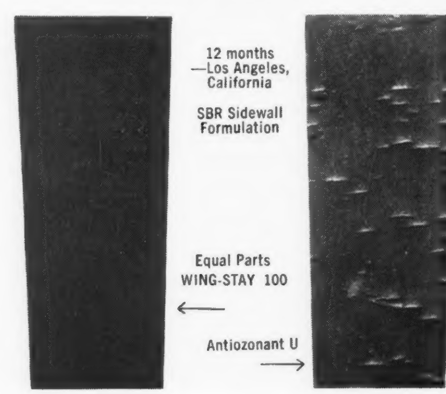
DYNAMIC ROOF AGING



DYNAMIC OUTDOOR EXPOSURE



STATIC WEATHERING



Why not prove it to yourself...

The best test is your own, so why don't you evaluate WING-STAY 100 as soon as possible? It's available, as an already-incorporated stabilizer in PLIOFLEX 1500C (a "cold," nonextended SBR), in PLIOFLEX 1710C (a "cold" SBR extended with 37½ parts of aromatic oil), and PLIOFLEX 1712C (a "cold" SBR extended with 37½ parts of highly aromatic oil).

Or you can obtain it as a safely and easily handled flaked solid for use as an additive protective agent. To get maximum protection at minimum cost, why not try WING-STAY 100 in combination with PLIOFLEX rubber stabilized with the same superior product.

Samples of WING-STAY 100 or of PLIOFLEX rubbers containing it – plus full technical assistance – are yours, simply by contacting your nearest Chemical Division representative or writing:

Goodyear, Chemical Division, Department W-9418,
Akron 16, Ohio

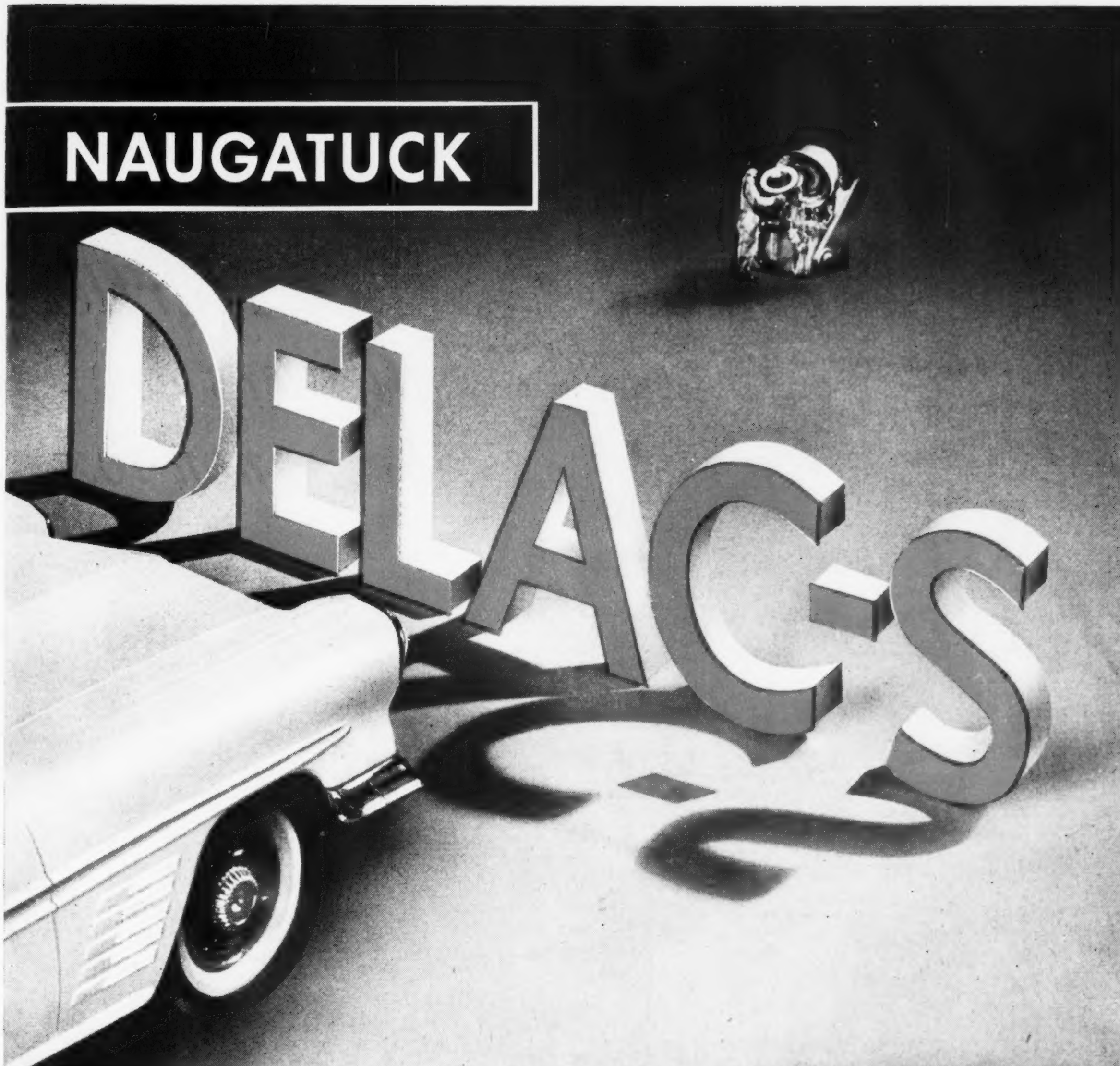
GOODYEAR

CHEMICAL DIVISION

Plioflex, Wing-Stay–T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

AGENT 36
SILICONE SQUAD
AGENT 36
HOW I KEPT A LAUNCHIN' DATE
FROM THE OFFICIAL FILES OF DOW CORNING
THE RUBBER SEAL, VON GARD! THE SEAL! WHERE IS IT? WE'RE COUNTING.
ACH! DER MOLDER NEIN SPECS MEETS. DAS MOLDS BEN GESTICKEN
POST NO BILLS
1
MEANWHILE, BACK AT THE PLANT...
ANOTHER NO GOODNIK!
WE'VE HAD IT. LET'S GO BACK TO MAKING JAR RUBBERS.
OVER MY DEAD DAGUERREOTYPE.
OUR FOUNDER
2
YOU'RE BLUE WITH GOO! MY CURE IS SURE.
JUMPIN' JUPITER! WHO LET YOU IN?
I DIDN'T.
AGENT 36
MISS KAY NAVERAL
3
I HEARD YOUR DISTRESS BEEP AND BLASTED RIGHT OVER. PUT DOW CORNING SILICONES TO WORK. YOU'LL HAVE A PERFECT SEAL EVERYTIME.
I'M WITH YOU, 36.
AGENT 36
NIKE KNIGHT
4


THE DIFFERENCE IS DOW CORNING 36 EMULSION! MOLDS RELEASE EASILY... GIVE SHARP SURFACE DETAIL. YOU REDUCE SCRAP, SPEED PRODUCTION, CUT MOLD CLEANING TIME, SAVE MONEY. ALL THAT!
OUR FOUNDER
AGENT 36
BY GEORGE, I THINK WE'VE GOT IT!
YOU'RE A DOLL, 36.
5
MEANWHILE, BACK AT THE LAUNCHING PAD...
STILL SANS SEAL? WE'LL NEVER ORBIT, ALBERT.
VOT A BUST. VOT A VASTE!
LISTEN! THEY'RE PLAYING OUR SONG.
YES, "HOW HIGH THE CHEESE"
6
AND NOW... THE HAPPY ENDING
THAT SEAL PUTS PI IN THE SKY!
THERE SHE GOES, AT LAST! THE SEAL WAS PERFECT... WHAT A BLAST!
VOT'S DER SCHIECRET, 36? DON'T LEAF UNS MID-LUFT
CONFIDENTIALLY, DOW CORNING SILICONES. THEY'LL HELP ANYONE WITH MOLD RELEASE PROBLEMS.
AGENT 36
7
GOOD SHOW, 36.
WUNDERBAR.
AGENT 36
YOU CAN RELY ON DOW CORNING SILICONES EVERY TIME. THEY'RE THE GREATEST
8
YOU CAN'T FIND A BETTER RELEASE AGENT THAN 36 EMULSION. GET YOUR FACTS. DOW CORNING'S THE SOURCE. DO IT NOW!
first in silicones
Dow Corning CORPORATION
MIDLAND, MICHIGAN
ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



DELAYED ACTION ACCELERATOR

fast acceleration...when you want it

The growing use of the more scorchy furnace blacks and increasing demand for faster curing cycles pose an industry-wide problem. The answer is Naugatuck's DELAC-S delayed action accelerator.

The most stable of the sulfenamide accelerators, DELAC-S may be used as the sole accelerator, with full scorch safety and a curing time less than that of other delayed action accelerators. Or it may be compounded with Retarder J or with activators to give precisely the combination of processing speed and safety your particular operation requires.

An important additional advantage of DELAC-S is its relatively low cost. DELAC-S is available in mixed ton or truck shipments with Naugatuck Thiazoles. For more information on this new Naugatuck delayed action accelerator, write the address below today.

Naugatuck Chemical

Division of United States Rubber Company 1120R Elm Street Naugatuck, Connecticut

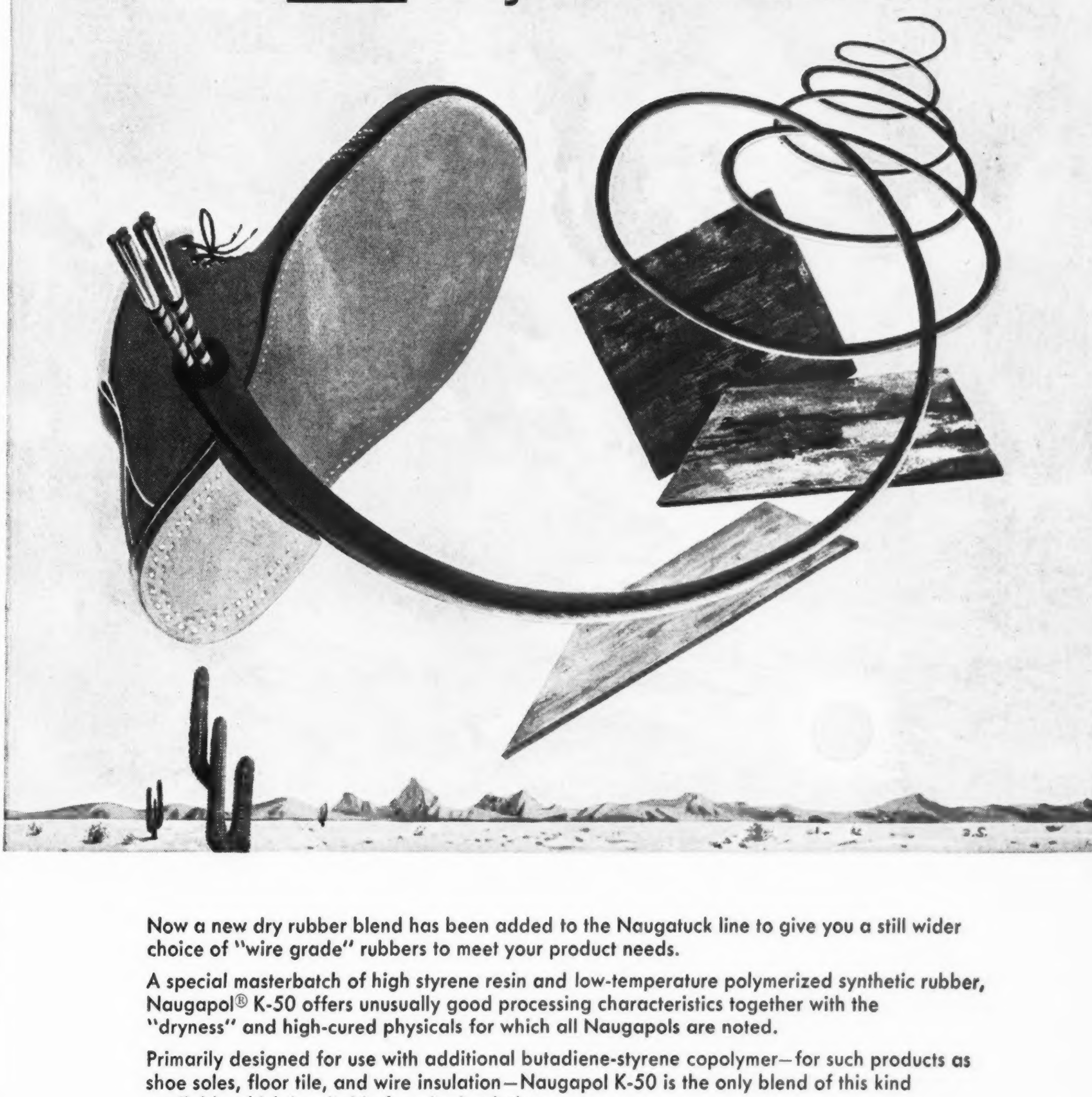
NAUGATUCK US RUBBER

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N.Y.

NAUGAPOL K-50

SPECIALLY-PROCESSED SBR POLYMER

...a new dry rubber blend



Now a new dry rubber blend has been added to the Naugatuck line to give you a still wider choice of "wire grade" rubbers to meet your product needs.

A special masterbatch of high styrene resin and low-temperature polymerized synthetic rubber, Naugapol® K-50 offers unusually good processing characteristics together with the "dryness" and high-cured physicals for which all Naugapols are noted.

Primarily designed for use with additional butadiene-styrene copolymer—for such products as shoe soles, floor tile, and wire insulation—Naugapol K-50 is the only blend of this kind available which is suitable for wire insulation.

Try Naugapol K-50—available in pellet form—wherever you require high dielectrics, low-ash, easy processing. For detailed information on Naugapol K-50, the Naugapols generally, or still other special grades of synthetic rubber, write us today.

Naugatuck Chemical

Division of United States Rubber Company 1120 N. Elm Street Naugatuck, Connecticut

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N.Y.


In a Hurry for...
UNION CARBIDE
TRADE-MARK
Silicones
Maglite® "D"
Stabilite®
Colors rubber or plastic
Ester Plasticizers
Call Hall
Ever find yourself on a spot—short of some item? Your answer is as near as the telephone. When you need rubber chemicals in a hurry, a call to us helps you off that spot, quickly.
For service on regular orders . . . for emergency service any time . . . call The C. P. Hall Company's nearest office.
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Color
C.P.Hall
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CHICAGO PHONE POrtsmouth 7-4600
MEMPHIS PHONE JAckson 6-8253
LOS ANGELES PHONE MAdison 2-2022
NEWARK PHONE MArket 2-2652

4

reasons why permanently-attached couplings mean better service, bigger profits!

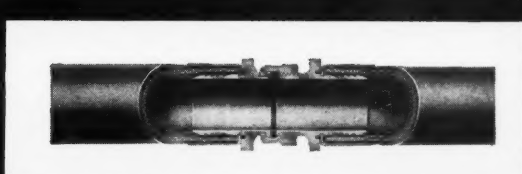
1 PERMANENTLY-ATTACHED HOSE COUPLINGS COST LESS than re-attachable couplings. Modern hose is of such good quality, lasts so long, by the time hose needs replacing so do re-attachable couplings.

2 CONTINUING ECONOMY WITH PERMANENTLY-ATTACHED COUPLINGS. You do away with hidden expenses involved in reconditioning re-attachable couplings. No time lost, less paper work, no shipping, etc.

3 MACHINE-ATTACHED FOR PRECISION FITTING AND FULL FLOW. You get a permanently fitted coupling every time . . . there's never a chance of possible costly damage to hose.

4 LEAK-PROOF COUPLINGS. Permanently-attached couplings form a firm grip with the hose . . . they won't leak. The ferrule is locked to the shank of the coupling, preventing creepage.

For fuel-oil hose . . . permanently-attached couplings by **SCOVILL**



For complete specifications on fuel-oil hose couplings write to Scovill Manufacturing Co., Merchandise Division, 88 Mill St., Waterbury 20, Conn. Ask for Bulletin No. 520-H.

Lucky it's

. . .

How to strengthen the grip of a solvent-type adhesive

Have you been thinking of phenolic resins mainly as agents for compounding hard and semi-hard rubber stocks?

Then you may be overlooking one of phenolics' most interesting roles—as reinforcing agents in solvent-type adhesives.

You can produce excellent adhesives using Durez resins with nitrile rubber, natural rubber, and Neoprene. These resins have also been used successfully for bonding nitrile rubber stocks to metals.

Nitrile rubber solvent cements

You get strong bonds that become even stronger on aging, with Durez resins as modifiers in nitrile rubber cements.

Such adhesives have been used extensively by the shoe industry and are particularly well suited for applications involving the bonding of vinyls. They are also finding widespread use as general-purpose adhesives.

The resins are highly compatible with nitrile rubber. They are soluble in acetone and methyl ethyl ketone, the solvents normally employed in these cements. From 30 to 75 parts of resin are used per 100 parts of nitrile rubber, depending upon the degree of reinforcement, hardness, or flexibility required in the adhesive film.

For most applications, only room-temperature cures are necessary. However, when you need greater bonding strength and heat resistance, curing at 250°F or higher gives a noticeable improvement.

Nitrile rubber-to-metal bonds

You can greatly simplify the bonding of cured and uncured nitrile rubber compounds to most metals by using specific Durez resins.

Good adhesions are obtained to copper, brass, aluminum, tin plate, and regular and stainless steel. Medium good adhesions are obtained to zinc plate and galvanized steel.

Dissolved in recommended solvents, the resin is applied to the prepared metal surface and air dried to eliminate the solvent. In bonding uncured stocks, the bond is obtained during vulcanization of the compound.

Neoprene solvent cements

Neoprene cements modified with a Durez resin give good adhesion to a variety of surfaces including most metals, wood, leather, and Neoprene, and fair adhesion to natural rubber.

Neoprene Type AC is generally used. The optimum amount of resin to use for good adhesion to all surfaces is 100 to 125% on the weight of the Neoprene.

Natural rubber solvent cements

Still another Durez resin has been used extensively as a modifying ingredient for natural rubber solvent cements, particularly in adhesives used by the shoe industry.

This material is a tough, high-melting thermoplastic resin possessing heavy viscosity or body. It greatly reinforces the adhesive film and, without reducing adhesive properties, it decreases the tendency of such cements to string, thus resulting in a stronger bond immediately.

Because of its high melting point and heavy viscosity in the molten condition, this resin improves bond strength at elevated room temperatures.

Normally 15 to 30 parts of resin on the weight of natural rubber are used in formulating, the amount depending on tackiness, hardness, and temperature resistance required.

Where else can Durez resins help you get properties you want?

Nitrile rubber compounds • Completely compatible with nitrile rubbers, Durez resins soften and plasticize the stock during processing, then aid vulcanization with substantial gains in strength, hardness, stiffness, abrasion resistance, heat and chemical resistance of the final cured stock. Compatibility and reactivity increase with increasing nitrile content.

GRS and natural rubber compounds • As plasticizers, Durez resins impart hardness, stiffness, and abrasion resistance to compounded stocks of GRS and natural rubber. Hardness and stiffness are retained at high temperatures. Compatibility with GRS is improved by using some nitrile rubber in the recipe.

Synthetic rubber latices • A highly effective means of hardening and reinforcing nitrile rubber latices is the use of Durez resin emulsions developed for this purpose. For modifying the properties of latex-treated papers, a water-soluble liquid resin is available. So far, the use of these resins is confined mainly to nitrile rubber latices. However, one Durez resin has produced very satisfactory results with certain high-styrene-butadiene latices.

For a more complete description of the application of Durez resins in solvent cements, in compounding, and in modification of latices, write for the illustrated bulletin, "Durez Resins in the Rubber Industry."

DUREZ®

HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION

211 Walck Road, North Tonawanda, N. Y.


LS

MR. CLIMCO SAYS . . .

CLIMCO LINERS

Permit Horizontal Storage of Stock

Horizontal storage is usually easier and more efficient — vertical storage has a tendency to curl the edges of the stock and liner, causing stock losses. When your liners are Climco Processed, you can confidently store them horizontally because the pressure of the roll will not cause sticking.

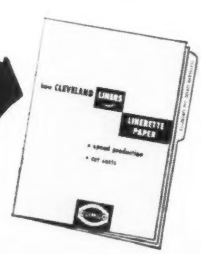
Climco Processed Liners will help you — whatever your method of storage.

They speed work by stopping stock adhesions and insuring easy separation. The life of your liner is increased, tackiness of the stock is preserved and loss of stock reduced. In addition to these production benefits, Climco Processed Liners protect the stock itself in many important ways.

Since 1922 Climco Processed Liners have proved their worth to the rubber industry. Give them a trial in your plant.

ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.



THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio, U.S.A.
Cable Address: "BLUELINER"

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Treatment Contains
NO OIL OR WAX
Samples on Request

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PROCESSED LINERS

Serving the Industry Since 1921

TITANOX* to the rescue! Part of the appeal of vinyl-covered furniture lies in its light or pastel finish . . . and part of the appeal of TITANOX titanium dioxide white pigments is how economically they produce properties of whiteness, brightness and opacity in plastic or rubber stocks. Whether your formula calls for TITANOX-RA, TITANOX-RA-50 or TITANOX-RA-NC, you'll find these leading white pigments a pleasure to work with—in uniformity that permits easy regulation of opacity and tint, in the contribution they make to product durability, and in ease of processing. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities.

TITANIUM PIGMENT CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

*TITANOX is a registered trademark for the full line of titanium pigments offered by Titanium Pigment Corporation.

5728

Famous escape artist meets his match

You've seen what often happens to bales of uncured synthetic rubber during shipment and storage. Subject to a condition called "cold flow," the uncured product was once an incorrigible "escape artist." It flowed, settled and burst from ordinary packages. Escaped rubber stuck to bits of cardboard, paper and dirt. Once contaminated, it was difficult to process the rubber into quality products.

Shell Chemical has solved this "sticky" problem—by caging 42 film-wrapped bales of synthetic rubber in a strong, lightweight, steel-strapped wooden container of unique design called the Flotainer*.

Completely new in principle, the Flotainer keeps rubber in check, prevents contamination, reduces waste, speeds handling, and lets you store 20 tons of rubber on less than 100 sq. ft. of floor space.

Leadership in packaging and delivery, plus versatility of product are qualities that customers have learned to expect from Shell Chemical. In addition—a specialized research and development organization devoted to general-purpose synthetic rubber assures prompt, dependable technical assistance.

**Flotainer* is a Shell Chemical Trademark.*

SHELL CHEMICAL CORPORATION
Synthetic Rubber Sales Division
P. O. Box 216, Torrance, California

Fill out and mail this coupon for a complete description of the Flotainer—plus a catalog of Shell synthetic rubbers and latices.

Name________________________

Title________________________

Company________________________

Address________________________

SHELL


1 OUT OF 4
OF YOUR
EMPLOYEES!
IN
IN
OUT

Here's how UOP 88® and 288® work to protect your rubber products

The ozone damage problem is becoming progressively more acute, and not all antiozonant compounds can cope with the increasing ozone levels. Reported instances of deterioration of rubber goods due to ozone attack are often quite dramatic. In a high ozone concentration area an unprotected rubber article may actually show ozone damage in a few days. Where ozone levels are not so high, ordinary base stocks may crack in a year or less, even under static conditions.

Here's proof

Absolute protection of your rubber products is assured when you use UOP 88 or 288. At the UOP research laboratories, new antiozonant formulations are continually being tested in a variety of base stocks. In addition, many manufacturers have tested UOP antiozonants in their own laboratories and in use. One customer recently reported that in a test of UOP 88 in their base stock, the UOP antiozonant afforded complete protection for 230 hours of exposure under fixed conditions of strain of 50 pphm ozone. Another antiozonant used in the same recipe failed and the tire cracked after only 30 hours exposure, while the unprotected base stock cracked in 5 hours.

Select right antiozonant for best result

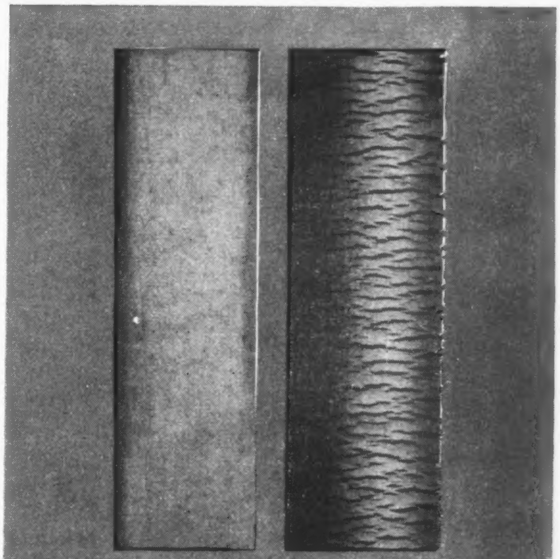
How long and how well antiozonants will work for you depends on the potency of the antiozonant and the various factors involved in compounding. One may give satisfactory protection under static conditions but fail under flexing. Another will provide mediocre protection in either static or dynamic service. UOP 88 and 288, however, provide excellent, tried and proven ozone protection to rubber goods in storage and in use.

At Universal Oil Products Company research scientists and technicians work constantly, testing and improving the UOP family of antiozonants.

What influences effectiveness

Effectiveness of antiozonant compounds may be influenced by these major factors:

1. Type of polymer, natural or synthetic.
2. Curing system.
3. Reinforcing agent.
4. Concentration of compounding ingredients, including the UOP antiozonant.
5. Conditions of use, including type of stress, ozone concentration, temperatures.



Rubber Strip Tests Show Effectiveness of UOP Antiozonants
The two rubber strips above were inserted in an ozone cabinet under identical, controlled conditions. The rubber in the sample shown on the right did not contain an antiozonant and reveals marked ozone damage. The SBR sample on the left contains two parts phr of a UOP antiozonant and reveals no ozone cracking after equal exposure.

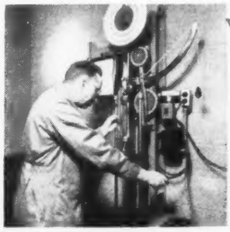
The concentration level of the UOP antiozonant must be related to other ingredients in the compounding recipe and to exposure conditions. Variations in type or concentration of ingredients reduce or enhance the final, lasting effectiveness of the antizonant.

About your product . . .

For one penny per pound of base stock of your product, UOP 88 or 288 antiozonants will provide years of ozone protection, prevent ozone cracking even under severe atmospheric exposure. UOP facilities and technical personnel are at your disposal for counseling on your particular antiozonant needs. Just phone, write or wire our Products Department.

Exaggerated conditions of stress and ozone concentration in the oven assure complete protection under any normal conditions.

In the Universal rubber laboratory, a rubber mill is used to incorporate experimental UOP antiozonants in various rubber polymers.



Every day we test a number of rubber recipes. The Scott Tester is used to measure physical properties of an experimental vulcanizate.

UOP 88® and 288®

RUBBER ANTIOZONANTS

UNIVERSAL OIL PRODUCTS COMPANY

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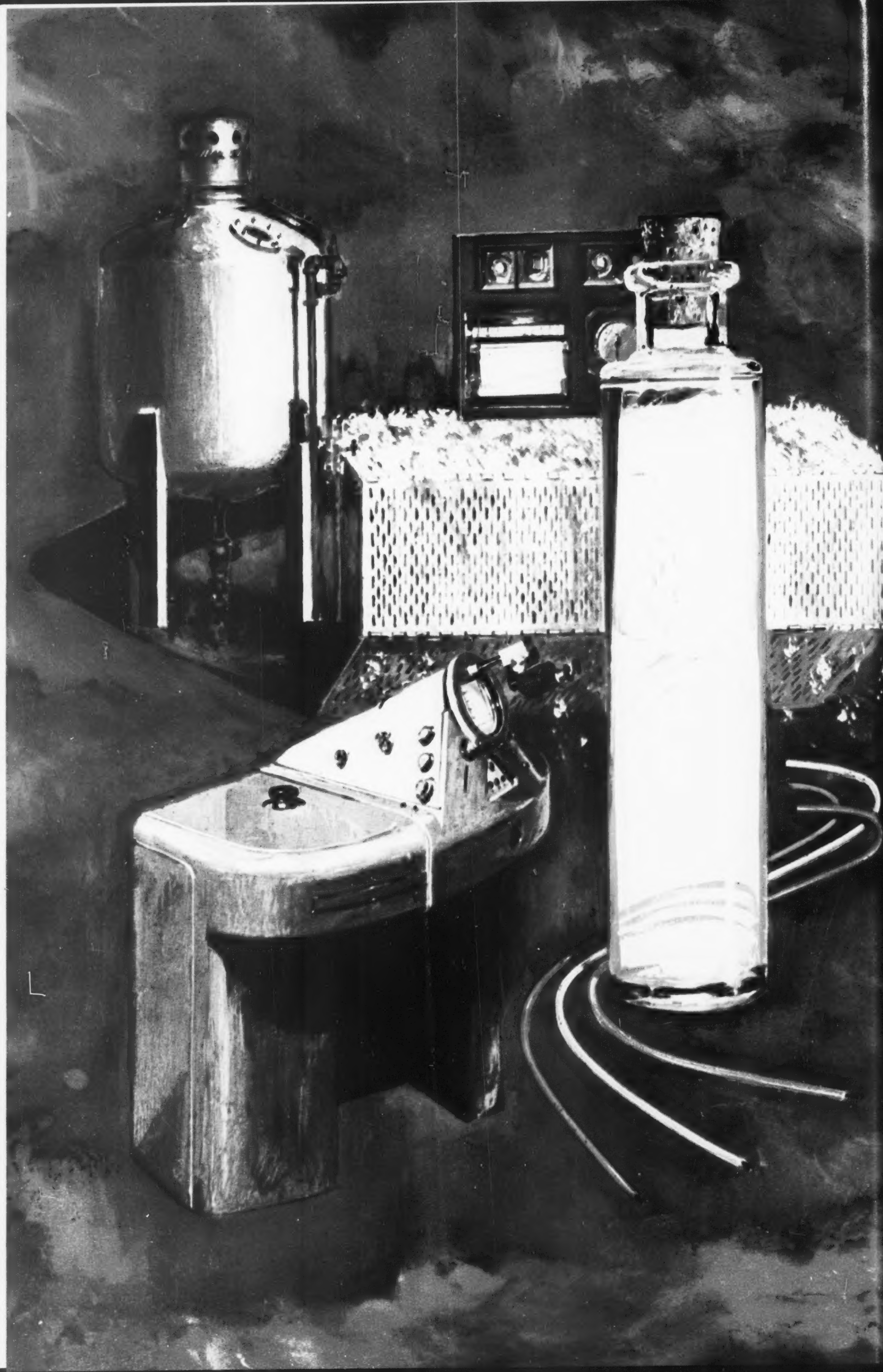

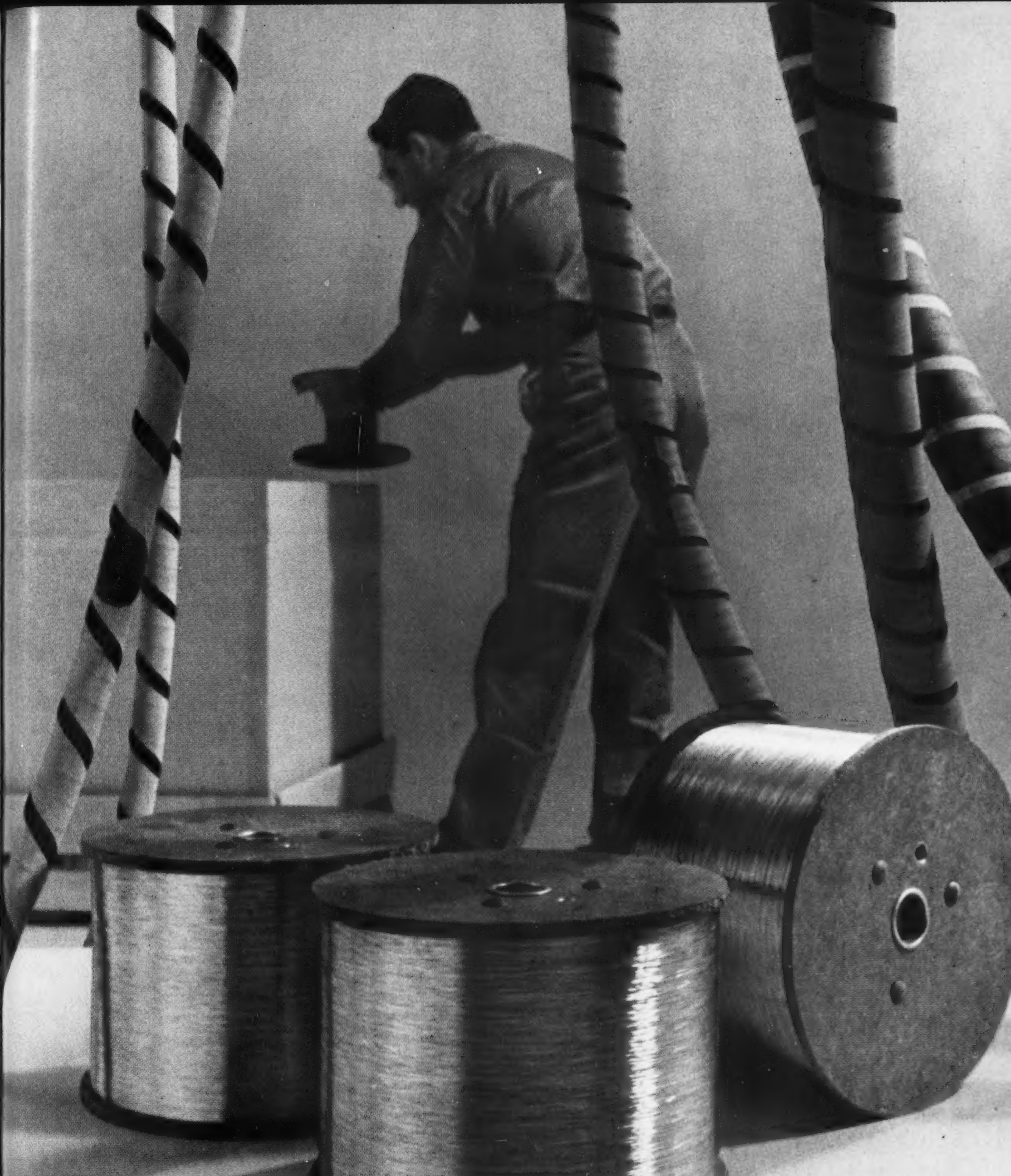

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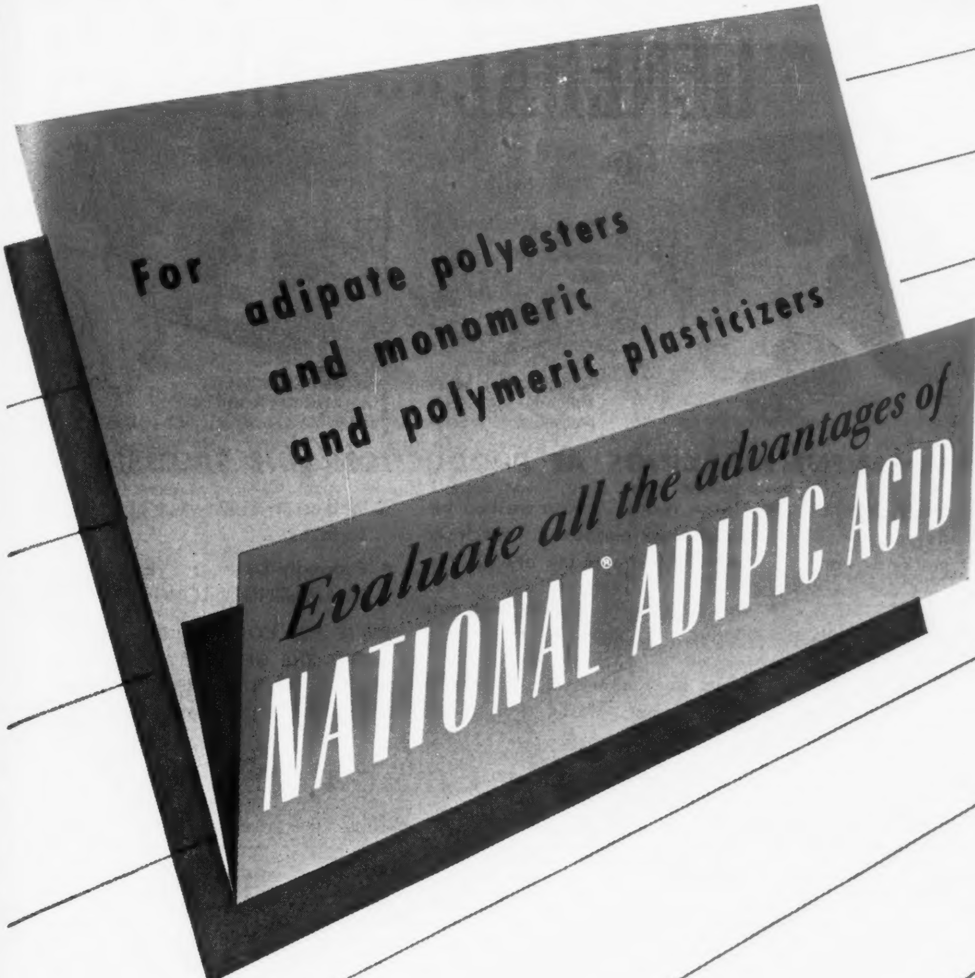
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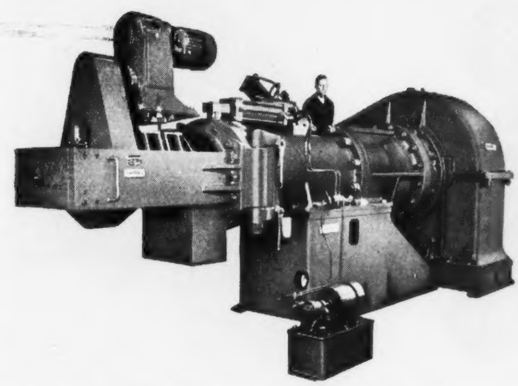

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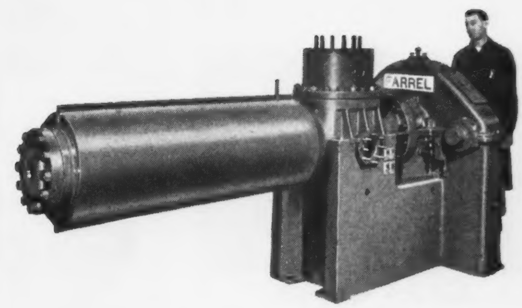

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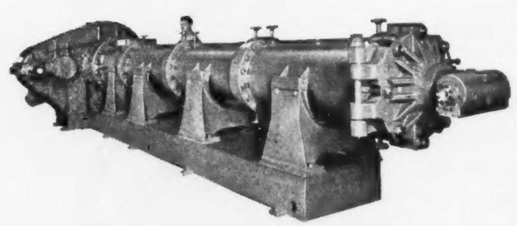

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RUBBER WORLD

EDITORIAL

"Rubber" Must Be Redefined In Terms of Present-Day Needs

RESPONSIBLE leaders in the rubber industry, both technical and non-technical, have had to face the fact during the past year that they do not have an adequate definition for their major raw material, rubber, that will stand up in court. Business in this country and internationally is being hampered because there are no generally acceptable definitions for "rubbers" and "plastics" that are workable where classifications are required for transportation and tariff purposes.

We have called attention to this situation in this column previously; the most recent instance was in May. Not only as editor of RUBBER WORLD, but also as chairman on nomenclature for Committee D-11 on Rubber of the American Society for Testing Materials and for the Rubber Division of the American Chemical Society, do we want to stress the urgency of this problem and urge anyone who has anything to contribute to forward his suggestions.

Some background information on the problem may be stated briefly, in part, as follows: The United States Tariff Commission reports to Congress in January on the latest attempts to modernize the 30-year-old schedule of U. S. tariff definitions. The Commission's proposed definition for rubber reads:

"The term 'rubber,' in this subpart, means a substance in bale, crumb, powder, latex, or other crude form, whether or not containing fillers, extenders, pigments, or rubber-processing chemicals which can be vulcanized or similarly processed into materials which can be stretched at 68° F. to at least twice their original length and which after having been so stretched and the stress removed, return with force to approximately their original length."

Then there is the Brussels Nomenclature for Classification of Goods in Customs Tariffs appended to the General Agreement on Tariffs and Trade which defines "synthetic rubber" in a manner that is at the same time too restrictive and too broad. This definition reads:

"Apart from thioplastes (which are specifically excluded) the expression 'synthetic rubber' applies and applies only to unsaturated synthetic substances, which can be irreversibly transformed into non-thermoplastic substances by vulcanization with sulfur, selenium, or tellerium and which, when so vulcanized as well as may be (without the addition of any substances such as plasticizers, fillers, or reinforcing agents not necessary for cross-linking), can produce non-thermoplastic substances which at a temperature of 15° to 30° C. will not break on being extended to three times their original length and will return after being extended to twice their original length within a period of two hours to a length not greater than one and one-half times the original length."

We are convinced that the technical men of the American rubber industry can develop better and more suitable definitions than those given above. This will require a coordinated effort, however, in which RUBBER WORLD and its editor are most willing to participate. *Let us have your comments and suggestions now!*

R. G. Seaman

EDITOR

RUBBER WORLD

Odd Electrons in Rubber Reinforcing Carbon Blacks[1]

By GERARD KRAUS and R. L. COLLINS
Phillips Petroleum Co., Bartlesville, Okla.

THE mechanism of carbon black reinforcement of elastomers has long been the subject of intense study and, at times, of considerable controversy. General, non-specific Van der Waals adsorption, physical adsorption at active centers, chemisorption through functional groups on the carbon surface, reaction with rubber involving the vulcanizing agent, and reaction with rubber through free radical acceptor sites have all been proposed as explanations for the outstanding reinforcing qualities of carbon black. There is evidence in support of all these phenomena, but it is still far from clear which ones are truly necessary and sufficient for the development of the reinforcement effect. Recent research has pointed increasingly toward a combination of physical adsorption and a chemisorptive mechanism.

The observations that shear-generated polymeric free radicals apparently react with carbon black on the mill (1),[2] that stable unpaired electrons are detectable in many carbonaceous materials by their paramagnetic resonance absorption (2-8), and that carbon blacks can be deactivated by certain free radical reagents (9-10) point to the possibility that the chemisorptive component of reinforcement may be developed in a free radical reaction involving unpaired electrons on the carbon black surface itself. While this idea is not new and has been the basis of much speculation, the actual experimental facts supporting it are distressingly meager. The present studies were undertaken with the objective of establishing closer connections between the unpaired electrons in carbon black, their reactivity, and the performance of the blacks in rubber.

The detection of unpaired electrons by electron spin resonance was first demonstrated by Zavoisky (11).

Division of Rubber Chemistry
American Chemical Society
AWARD
for excellence of Presentation and Content to
Gerard Kraus and R. L. Collins
for the paper entitled
Odd Electrons in Rubber Reinforcing Carbon Blacks
Presented before The Division of Rubber Chemistry
at Cincinnati · May 16, 1958
R. F. Dunbrook

Electron spin resonance depends upon a fundamental property of the electron—its spin. The spinning electron behaves much like a simple bar magnet when placed in a magnetic field. The only stable orientations are those in which the axis of the spinning electron is pointed with or against the magnetic field. A torque is exerted on any electron not so oriented, tending to aline it with the field. Like all rotating masses subjected to a changing axis of rotation, the electron resists this torque by precessing about the magnetic field. This rate of precession is known as the Larmour fre-

[1] Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 16, 1958.
[2] Numbers in parentheses refer to Bibliography items at end of this article.

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Gerard Kraus

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R. L. Collins

The Authors

Gerard Kraus, manager, rubber reinforcement section, research and development department, Phillips Petroleum Co., attended the University of Prague and Southern Methodist University and received his B.S. degree from the latter university in 1943. He received his Ph.D. degree from the University of Cincinnati in 1947.

Dr. Kraus was first an instructor and then an assistant professor at the University of Cincinnati from 1947 until he joined Phillips Petroleum in 1953.

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Russell L. Collins, group leader, exploratory studies group, at Phillips research and development department, received his B.S. from Tulsa University in 1948, his M.S. in 1950, and his Ph.D. in 1953 in physics, both from Oklahoma University.

Dr. Collins has been with Phillips Petroleum since 1953. He is also an adjunct professor, mathematics department, Oklahoma State University, on a part-time basis this year.

He is a member of the American Physical Society.

quency and is proportional to the applied field.

For free electrons, and for the unpaired electrons in most organic free radicals, this Larmour frequency is about 2.8 x 10^6 cycles per second per gauss.[3] As a result of the Boltzmann distribution, a slight excess of electrons is alined with the field, over those alined against it. Transitions between these two orientations can be excited by applying an oscillating magnetic field at right angles with the static field. This results in a net absorption of energy, and it is the reduction of power at the oscillating frequency which constitutes the observational basis for electron spin resonance measurements.

At readily attainable fields of several thousand gauss, the oscillating field lies in the microwave frequency range. The experimental techniques for observing the electron spin resonance are, therefore, those of microwave spectroscopy. An excellent exposition of the principles and apparatus of electron spin resonance, written for the non-expert, has recently been given by Pake (12). For a more comprehensive review the reader is referred to a paper by Wertz (13).

In an earlier paper of this series (14) it was shown that rubber-grade carbon blacks contain appreciable concentrations of unpaired electrons, in spite of the fact that many of these blacks have thermal histories which would lead one to expect little free radical activity in view of the known thermal instability of the unpaired spins in organic material charred at low temperatures (up to 600° C.). It was also shown that the unpaired electrons of carbon black can be annealed out by heat treatment at temperatures in excess of 1000° C. and that, on further increase in heat treatment temperature, a new spin species appears. From analogies in the electron spin resonance behavior with low-temperature chars on one hand and highly graphitic carbons on the other, it was proposed that the unpaired electrons in carbon black are mostly mobile π-electrons accessible to the surface and stabilized by oxygen; whereas those responsible for the resonance observed upon graphitization are σ-electrons originating from bonds broken in the process of recrystallization.

Experimental Details

Apparatus

The microwave spectrometer and the techniques employed in obtaining spin assays have been described previously (14). Magnetic susceptibilities were determined by the Guoy method.

Carbon Blacks

Blacks were extracted with toluene for 72 hours in Sohxlet extractors to remove tars which, incidentally, exhibit an electron spin resonance of their own. All surface treatments of carbon blacks were conducted on previously rigidly out-gassed blacks (24 hours at 250° C., 10^{-5} cm Hg) without intermediate exposure to the atmosphere. These treatments were accomplished in the following manner.

Oxygen

The black was out-gassed in the spin resonance sample capillary and shut off the vacuum system. Oxygen from a carefully calibrated metering bulb was then distilled on to the black by placing a liquid nitrogen bath around the sample tube. The sample tube was sealed off and was ready for electron spin resonance measurement.

[3] The unit of intensity of a magnetic field (field strength). A magnetic field which exerts a force of one dyne on a unit magnetic pole: one gauss (E.M.U.) equals 1/3 x 10^{-10} e.s.u.

Odd Electrons in Rubber Reinforcing Carbon Blacks

The detection of unpaired electrons by electron spin resonance is a new technique which furnishes much information about many materials and chemical reactions.

The number of unpaired electrons in several rubber-reinforcing blacks has been determined by quantitative electron spin resonance assay. The odd electron concentrations are of the order of 10^{19} to 10^{20} spins/gram. These concentrations are consistent with the negative (diamagnetic) net magnetic susceptibility of the blacks.

Oxygen and other paramagnetic substances, even in extremely minute quantities, exert a powerful influence on the electron spin resonance observed. Their effect is to broaden the resonance line, and this reduces considerably the signal intensity. In extreme cases the intensity may be reduced to the noise level; in less severe instances the broadening may lead to erroneously low spin assays. Carbon blacks differ in their susceptibility toward line broadening effects.

Evidence is presented for a correlation between the odd electron concentration of carbon blacks and the modulus they impart to rubber, suggesting a combination reaction between the carbon black radicals and polymeric free radicals formed during processing or vulcanization. The possibility of such a reaction is supported by electron spin resonance measurements on carbon blacks heated in the presence of rubber, both with and without curatives.

On the basis of the results available it is not possible to ascertain the full importance of the odd electrons of carbon black in elastomer reinforcement. It is certain that the unpaired electron spin resonance measurements on carbon reinforcement effects in general, although they may increase them substantially by providing an additional interaction mechanism for the union of black and rubber.

TABLE 1. ELECTRON SPIN CONCENTRATIONS IN CARBON BLACKS

Black	Type	N_2 Surface Area, M^2/G	Mole % Carbon	Spin Conc. $\times 10^{-19}$, Spins/G	Mass Susceptibility $\times 10^6$: Net	Paramagnetic[a]	Diamagnetic
Philblack[b] A	FEF	45.6	95.77	10.0	−.82	.21	−1.03
Philblack O	HAF	75.1	95.75	8.0	−.79	.17	−.96
Philblack I	ISAF	113.7	—	9.2	−.76	.19	−.95
Philblack E	SAF	134.6	94.78	8.1	−.73	.17	−.90
Wyex[c]	EPC	114.2	89.70	15.0	−.59	.32	−.91
Spheron 6[d]	MPC	111.5	92.00	13.9	−.66	.29	−.95
P-33[e]	FT	13.7	94.39	5.9	−.95	.13	−1.08
Acetylene	—	58.0	99.12	3.8	−2.6	.08	−2.68
Graphon[d]	—	93.7	99.66	1.1	−2.8	.02	−2.82

[a] Calculated from spin concentration and molar susceptibility of free electrons, 1270×10^{-6}. A paramagnetic substance is attracted by an inhomogeneous magnetic field toward the region of maximum field; a diamagnetic substance is repelled by such a field.

[b] Phillips Chemical Co., Akron, O.

[c] J. M. Huber Corp., New York, N. Y.

[d] Godfrey L. Cabot, Inc., Boston, Mass.

[e] R. T. Vanderbilt Co., New York, N. Y.

Paramagnetic Salts

A predetermined amount of salt was deposited from aqueous solution near the top of the sample capillary. The capillary was filled with black, sealed on to the vacuum system, and degassed at 250° C.; the top of the capillary containing the salt remained cool at all times. After degassing was complete, triply distilled water from a bulb on the vacuum system was distilled into the sample tube, washing the salt into the region of the tube occupied by the black. After sufficient time was allowed for uniform adsorption of the salt on the black, the water was removed by freeze-drying, and a final out-gassing step was performed at room temperature.

Rubber Samples

Rubber-carbon black batches were milled on a two-inch laboratory mill. The mix was extruded through a one-millimeter die, and the extruded sample filled into two- millimeter I.D. Pyrex tubing. The tubes were sealed to the vacuum system, the samples out-gassed at 25° C. for five days at 10^{-5} cm Hg, and sealed off under vacuum.

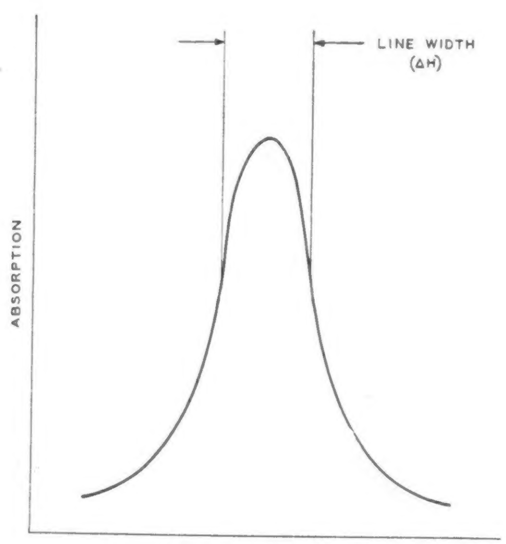
Unpaired Electron Concentration In Rubber-Grade Blacks

The number of unpaired electrons in typical rubber-grade blacks is not large. For this reason the net mag-

netic susceptibility is negative, i.e., the blacks are diamagnetic. Table 1 presents electron spin concentrations for a number of blacks and gives estimates of their relative contribution to the total mass susceptibility. The carbon content of the black is given also. The data indicate that the differences in net magnetic susceptibility of the common rubber-grade blacks is due to their unpaired electron content. Their diamagnetism is remarkably similar. Acetylene black and Graphon are more highly graphitic as is apparent from their high carbon content and diamagnetism. This is also consistent with their large crystallite dimensions.

Oxygen Effect and Related Phenomena

The information obtained experimentally from electron spin resonance spectroscopy includes a number of variables (14). In the present discussion only two of these—line width and unpaired spin concentration—need be considered. The *line width,* as defined here, is the width (in gauss) between the inflection points on the absorption curve. The *number of unpaired spins* in the sample is proportional to the area under the absorption curve.[4]



Some factors influencing line width in carbon blacks have been discussed in the earlier paper (14). Of particular importance in the present studies is the fact that traces of paramagnetic substances interact with carbon blacks in such a way as to broaden their resonance line (4, 14-16). This reduces the signal intensity even if the number of unpaired electrons in the sample remains fixed, for the area under the absorption curve must remain constant.

The unpaired spin concentrations of Table 1 were obtained on samples which had been out-gassed for 24 hours in a high vacuum at 250° C. with periodic flushing with helium. This precaution is necessary because molecular oxygen, being paramagnetic, has a pronounced influence on the resonance observed. The broadening of the magnetic resonance line by oxygen is probably the result of a shortening of the spin-lattice relaxation time (16). Accompanying this broadening, in many instances, is an apparent reduction in the concentration of unpaired spins.

It has been proposed (4, 17) that this reduction may be caused by a reaction of the spins with oxygen, but such a mechanism is not very plausible as many of the lost spins can be restored by merely flooding the sample with cold benzene. The authors have proposed as an alternate explanation that some components of the resonance line are broadened beyond the limits of detection. The data of Table 2, which are concerned with the quantitative aspects of the oxygen effect, seem to support the latter contention. The data are for MPC black (Spheron 6) heat treated for two hours at 750° C. This black was chosen because of the large sensitivity of its resonance line toward oxygen. The magnitude of the oxygen effect is truly remarkable; 0.7% of a monolayer (0.0072 fraction) broadens the line tenfold when compared with the control, and 40% of a monolayer (0.390 fraction) broadens the resonance signal beyond detection. The data in the last two columns do not show a clear-cut stoichiometric relation between the apparent spin content and the number of oxygen molecules introduced. The results, however, are not inconsistent with the idea of broadening some components of a composite line beyond detection.

TABLE 2. EFFECT OF OXYGEN ON MAGNETIC RESONANCE OF 750° C. HEAT-TREATED MPC BLACK

Oxygen, Ml S.T.P./G	Max. Possible Fraction of Monolayer Coverage[b]	Line Width, Gauss	Apparent Spin Conc. $\times 10^{-19}$ Spins/G	Molecules O_2 Per Spin "Removed"
0.000	0.000	2.9	9.91	–
0.114	0.0027	3.5	13.1[c]	?
0.306	0.0072	30	8.61	0.63
0.584	0.014	52	5.49	0.35
1.62	0.038	104	3.71	0.70
5.40	0.127	very broad	[a]	1.5
16.5	0.390	no resonance detectable		–

[a] Signal approaches noise level.
[b] Calculate on basis of 14.1 sq. Å for molecular area of O_2 assuming all oxygen adsorbed.
[c] Value doubtful; sample broke before cavity degradation correction could be determined accurately.

In the example cited in Table 2 oxygen at about 1% of monolayer coverage already introduces a sizable error into the spin assay. Although not all blacks are equally sensitive to the oxygen effect, it is clear that any sort of quantitative experiments concerning the unpaired electrons in carbon blacks will have to be performed on stringently out-gassed samples, a restric-

[4] When phase-sensitive detection is employed, as in the present studies, the spectrometer records the derivative of the absorption curve. The line width is then measured as the distance on the magnetic field axis between the maximum and the minimum of the recorder trace and the spin assay becomes proportional to the first moment of the recorded curve. For details of the measurements see reference (14).

tion which is not always easy to overcome. Table 3 lists values of oxygen effect, expressed as ratio of line width (ΔH) measured in air and *in vacuo* (250° C. degassed), for the blacks of Table 1. Sensitivity toward the oxygen effect appears to be largest for the channel carbons.

Other Line Broadening Materials

The broadening of the resonance line of carbon blacks is not confined to oxygen; other paramagnetic molecules or ions are capable of producing a similar effect (4). This point is important in experiments involving interaction of carbon black and rubber if the latter contains transition metals as impurities. This point will be discussed further in a later section of this paper.

An idea of the sensitivity of the resonance toward paramagnetic salts may be obtained by examination of Table 4. The experiments in question were conducted by depositing the salts from aqueous solution on black out-gassed at 250° C. under vacuum and distilling off the water. The control sample, which was prepared in identical manner except for omission of the solute, has a line width which exceeds slightly the line width of the control in Table 2 (the same black was used in both experiments), indicating that complete exclusion of oxygen was not achieved. A trace of oxygen was probably introduced with the water and was not removed in the final distillation and out-gassing, which were carried out at room temperature to avoid loss of the adsorbates. In spite of this the data show conclusively the broadening effect of the salts.

TABLE 3. OXYGEN EFFECT IN VARIOUS BLACKS

Black	ΔH (Air)/ΔH (Vac.)
Philblack A	2
Philblack O	2
Philblack I	2.5
Philblack E	6.5
Wyex	13
Spheron 6	20
P-33	1.5
Acetylene	1.5
Graphon	1.0

TABLE 4. LINE BROADENING BY PARAMAGNETIC SALTS

(MPC Black Heat Treated at 750° C.)

Salt	Molecules per Gram of Black $\times 10^{-19}$	Sq. Angstroms per Molecule	ΔH (Gauss)
None	–	–	5.2
$FeCl_3$	2.8	580	11.3
$FeCl_3$	61	26	125
$K_3Fe(CN)_6$	0.65	2500	18.6
$K_3Fe(CN)_6$	31	52	281

Comparison of the data of Tables 4 and 2 brings out the interesting fact that potassium ferricyanide is roughly as effective as oxygen in line broadening (oxygen produces a line 30 gauss wide at a reciprocal coverage of 1960 Å²/molecule), but ferric chloride is less so, perhaps because of differences in distribution over the black surface.

Spin Concentration and Rubber Properties

The question which arises immediately is whether or not a direct correlation exists between spin concentration and reinforcing properties. Table 1 allows no such a conclusion if for no other reason than the blacks have different surface areas. In the furnace black series reinforcement increases steadily in passing from FEF to SAF, which is the order of increasing surface area, but the spin concentration remains essentially constant. This need not be inconsistent with a possible spin *vs.* reinforcement correlation, as long as the spins are distributed throughout the volume of the particles, for in this instance the fraction accessible to rubber would increase with specific surface area.

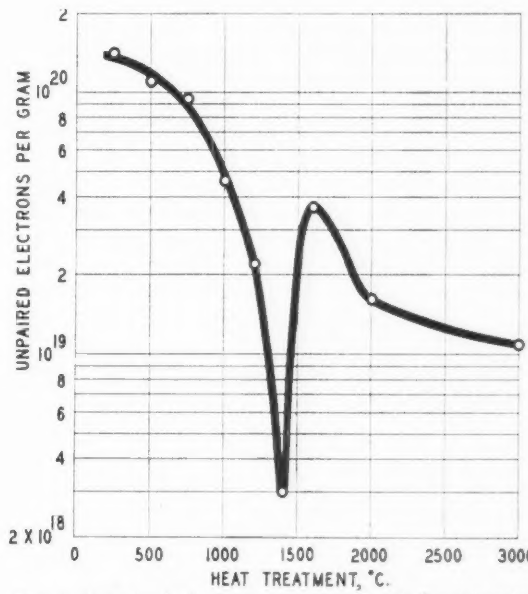


Fig. 1. Unpaired electron concentration in heat-treated channel black (degassed at 250° C.)

Perhaps a more meaningful correlation can be obtained from the data of W. R. Smith and associates, of Godfrey L. Cabot, Inc., on the effects of heat treatment of MPC black on rubber properties. Spin concentrations were determined on a series of heat-treated Spheron 6 samples kindly furnished us by Dr. Smith. The results, which were reproduced in Figure 1, clearly illustrate the virtual disappearance of the original spins at 1400° C. and the reappearance of the new species (σ-electrons) at 1600° C. Rubber properties, reproduced from the paper of Schaeffer and Smith (18), are

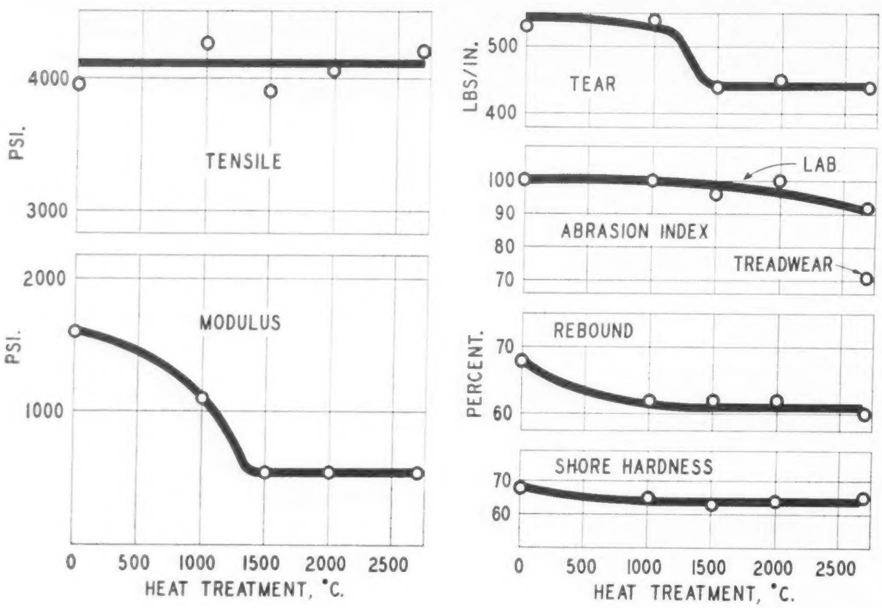


Fig. 2. Physical properties of natural rubber reinforced with heat-treated MPC blacks (18)

shown in Figure 2. It is immediately obvious that the only clear-cut apparent correlation with spin concentration is with modulus and that this correlation is confined to the blacks heat treated below 1400° C. Furthermore, it must be borne in mind that other processes also occur on heat treatment, particularly the loss of "volatile constituents" as CO, CO_2, and H_2. Further evidence will, therefore, be needed to establish unequivocally a correlation between unpaired spin concentration and modulus. Regardless, there is much that is attractive about the possibility of such a relationship.

Schaeffer and Smith (18) point out that the principal drop in modulus coincides with the loss of hydrogen, but it is difficult to find a mechanism to explain such a connection. A mechanism to explain a drop in modulus as a consequence of a loss of unpaired electrons is much easier to visualize. Modulus depends among other things on the number of fixed points in the network representing the cured vulcanizate. Carbon blacks, like the stable free radical 1,1-diphenyl-2-picryl hydrazyl, combine with rubber and, in doing so, form gel. The simple free radical reaction,

$$B\cdot + R\cdot \longrightarrow BR$$

(Black) (Rubber Free Radical) (Rubber Attached to Black)

therefore, could readily account for a modulus correlation. The absence of such a correlation for graphitized blacks can also be understood. The unpaired spins in these are less numerous (Figure 1) and for the most part are not accessible at the surface, as is apparent by the absence of a well-defined oxygen effect (see Graphon in Table 3). The number of such spins available for interaction with rubber would be expected to be quite small.

Role of Unpaired Electrons

The above data make it amply clear that the unpaired electrons in carbon black are certainly *not necessary* for the development of reinforcement. This is consistent with the idea that more than one mechanism is involved in carbon reinforcement and with the fact that many colloidal non-carbon pigments, which contain no unpaired electrons at all, are also reinforcing agents for rubber. The role of the unpaired electrons in reinforcement can only be an *additional*, but possibly important effect.

In an attempt to ascertain the effect of the starting material and manufacturing process on the concentration of unpaired electrons in carbon black, a number of blacks prepared from pure organic feedstocks was subjected to electron spin resonance analysis. The results, which are shown in Table 5, indicate that furnace blacks, in general, have higher unpaired electron concentrations than thermal blacks. They also show that benzene yields blacks of higher spin concentration than cyclohexane. Evaluation of these carbons in rubber has shown the thermal blacks to give consistently lower modulus values than their furnace-type analogs.

It would be naive to expect a very *close* correlation of spin concentration with modulus in the data of Table 5, for there obviously are other factors which affect modulus and which are very difficult to control in such an experiment, e.g., curative adsorption, the effect of the black on cross-link yield, particle shape, and carbon black "structure" or aggregate shape.

Reaction of Unpaired Electrons In Carbon Black with Rubber

The reinforcing properties of carbon blacks can be impaired by treatment of the carbons with various free

TABLE 5. UNPAIRED ELECTRON CONCENTRATION IN EXPERIMENTAL BLACKS

Feedstock	Process	N_2 Surface Area, M^2/G	Spin Concentration $\times 10^{-19}$ Spins/Gram	300% Modulus[a] Psi.
Cyclohexane	Thermal	78	0.7	730
	Furnace	80	2.5	1550
Benzene	Thermal	36	2.3	540
	Furnace	46	15.2	1740
	Furnace	122	6.9	1430
Pyridine	Thermal	79	none detected	1080
	Furnace	174	5.2	1260

[a]50 phr of black in simple SBR-1500 test recipe; cure 30 minutes at 153° C.

radical reagents (9-10). The difficulties involved in elucidating the mechanism of these reactions make it impossible to say whether the loss in reinforcing ability is due to a decrease in free radical concentration of the black as a result of the treatment, or whether other chemical changes are responsible for the observed effects. It is here that electron spin resonance spectroscopy provides a most powerful tool in the form of the spin assay, for it allows direct observation of the system carbon black-rubber.

Early attempts to observe a change in the resonance on incorporation of carbon blacks in rubber were unsuccessful because the samples contained traces of oxygen, and it was not realized that rubber samples containing carbon blacks could be effectively out-gassed at room temperature. For instance, a mill-mixed batch of 40 parts SAF black in *cis*-polybutadiene gave the following line widths:

	$\triangle$H (Gauss)
As milled	115
Out-gassed *in vacuo* at 25° C.	27.6
Dry black out-gassed at 250° C. *in vacuo*	20

The slight amount of broadening persisting in the rubber-carbon black mix is not considered sufficient to endanger the reliability of the spin assay. A further complication arises when the polymer contains traces of transition metal impurities, as does commercial SBR. These impurities are present in sufficient quantities to cause line broadening, usually after the sample is heated, thus allowing the paramagnetic impurities to diffuse to the surface. The following experiment in which an SAF black/SBR-1500 mixture was heated in a high vacuum after degassing illustrates this point:

	$\triangle$H Gauss	Apparent Spin Concentration $\times 10^{-19}$, Spins/Gram
SAF black (dry)	20	8.4
SAF in SBR-1500, out-gassed	26.4	9.9
Same, heated 16 hours at 153° C.	85	8.1

Because of the severe line broadening encountered it might be dangerous to ascribe significance to the lower assay on the heated sample (8.1×10^{19} *vs.* 9.9×10^{19} on the sample as milled).

Effect of Metals

The effect of contamination by transition metals can be demonstrated dramatically by adding a small amount of iron (0.07%, as iron stearate) to one of the new solution-type polymers which are initially free of paramagnetic impurities. The following example is for a mix containing 40 parts of SAF black in *cis*-polybutadiene:

	$\triangle$H Gauss
Iron-free, out-gassed	22.5
Same, heated 30 minutes at 153° C.	5.7
Contaminated, out-gassed	36.8
Same, heated 30 minutes at 153° C.	>500

It will be noted that for the iron-free sample the line actually narrowed after heating. This is fortunate

TABLE 6. REACTION OF CARBON BLACK FREE RADICALS WITH ELASTOMERS

Black	Black Loading, Phr	Polymer	Curatives	Heating Time at 153° C., Min.	$\triangle$H Gauss	S $\times 10^{-19}$, Spins/Gram
HAF[a]	—	—	—	—	29	7.3
SAF[a]	—	—	—	—	20	8.4
EPC[a]	—	—	—	—	1.1	12.2
HAF	50	SBR	none	0	31	9.7
				30	13	9.2
				840	21	8.9
SAF	40	SBR	none	0	26	11.8
				30	7.1	9.1
				840	6.0	9.5
SAF	40	*cis*-PBd	none	0	23	9.6
				30	5.7	9.3
				1000	3.6	8.1
SAF	40	*cis*-PBd	tread recipe[b]	0	25	9.0
				30	7.1	7.7
				1000	4.9	6.0
EPC	50	*cis*-PBd	none	0	1.6	10.2
				30	1.2	7.7
				1000	1.2	8.8
EPC	50	*cis*-PBd	tread recipe[b]	0	1.7	9.9
				30	1.6	4.7
				1000	1.2	6.4

[a]Out-gassed 24 hours at 250°C. at 0.01-micron Hg.

[b]Recipe:

Polymer	100
Black	as shown
ZnO	3
Stearic acid	2
Resin 731*	3
Sulfur	1.1
Santocure†	1
Flexamine‡	1

*Hercules Powder Co., Wilmington, Del.
†Monsanto Chemical Co., Akron, O.
‡Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

in that it improves the reliability of the spin assay. In particular, lower spin assays accompanied by line narrowing will be conservative and should be treated with respect.

Rubber-Black Experiments

Several rubber experiments, complete with estimates of spin concentration, are summarized in Table 6. With furnace blacks the spin concentration increases slightly on incorporation of the black into the polymer and drops on heat treatment. Channel black does not display the initial rise. The presence of curatives appears to accentuate the drop in spin concentration on heating. This type of behavior has been observed in a number of similar examples.

The observation of a maximum in spin concentration after milling, but prior to heating or vulcanization, indicates that simple coupling of the carbon black radicals with polymer free radicals is not the only reaction mechanism by which the spin concentration changes and which leads to attachment of rubber to the black surface by primary valence bonds. It appears highly probable that the explanation for the initial rise in the number of free radicals is to be sought in the stabilization of the shear-generated polymeric radicals by non-radical acceptor sites on the black surface to produce a new, more stable type of radical. (Under the experimental conditions of the present study no shear-generated rubber radicals could be detected in gum stocks, evidently because of their tendency toward relatively rapid recombination.) Since the coupling reaction involving the original unpaired electrons with rubber is at least partially compensated for by the creation of new radicals, the spin assay tends to underestimate the extent of total reaction leading to attachment of polymer to the surface. Failure to observe a maximum spin concentration for EPC black is not inconsistent with the ideas expressed; it is only necessary in this instance for coupling to have become dominant by the end of the milling and out-gassing steps thus eliminating the maximum

It should be noted that the results of this investigation lend direct support to the various free radical mechanisms proposed for the interaction of carbon black and rubber (1, 9-10), albeit without proving the role of these reactions in elastomer reinforcement in general. This, quite naturally, raises the question of the identity of the various reactive species on the black surface. The fact that the fall in spin concentration on high-temperature heat treatment of carbon black roughly coincides with loss of oxygen (as well as hydrogen) suggests that the carbon black radicals may be oxygenated species (14), possibly semi-quinones (19). Similarly, quinone groups, the presence of which in carbon blacks seems fairly well established (19-21), might provide the sites necessary for stabilization of polymeric free radicals by conversion to more stable semi-quinone radicals. Such reactions are well known in the inhibition of free radical polymerization by quinones, and their occurrence would hardly be surprising in this case.

Summary and Conclusions

Rubber-grade carbon blacks contain appreciable concentrations of unpaired electrons. These electrons appear to be reactive toward rubber. The reaction with rubber may lead to points of attachment of the rubber by primary valence bonds and, as a result, should play a part in reinforcement. This reaction, however, does not appear to be the sole source of such attachments; nor can it be proved that such attachments are *necessary* for the development of the reinforcement effect, although they are thought to augment and improve it.

Acknowledgments

The authors wish to express their sincere appreciation to M. D. Bell, who performed most of the electron spin resonance measurements and to K. W. Rollmann and J. T. Gruver who prepared the samples. Acknowledgment is also due to J. C. Krejci for furnishing the experimental carbon blacks used in this study.

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The Influence of Particle Size On the Viscosity of Synthetic Latex—II[1]

The Effect of Particle Spacing

By ROBERT H. KELSEY and PAUL H. JOHNSON
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THE relation between the concentration of particles in a dispersion and its viscosity has been studied by a number of investigators. E. G. Richardson,[2] working with oil-in-water emulsions, found the apparent viscosity to be inversely proportional to the mean particle diameter and proposed that the variations of viscosity with concentration and with rate of shear might be explained on the basis of the work done in distorting the particles as they were driven past one another.

I. M. Krieger and S. H. Maron[3] have studied the flow of synthetic rubber latices in considerable detail, using both concentric cylinder and capillary viscometers. They have indicated the limits in which such latices are Newtonian and have verified an exponential flow law, for concentrations above the limit of Newtonian behavior.

S. H. Maron, B. P. Madow, and I. M. Krieger[4-5] further examined the variation of viscosity with concentration of a styrene-butadiene Type V[6] latex and deduced an empirical equation of the form

$$\eta' = \eta_o b \frac{\alpha\phi}{1 - \alpha\phi} \tag{1}$$

where η' is the viscosity term in the flow equation; ϕ is the volume fraction of rubber; and a and b are constants. If, as they suggest, the length of the adsorbed soap molecule be taken into account, this formula predicts infinite viscosity at $\phi = 0.75$ to 0.77, which is nearly that for close-packing of spheres. Subsequently these results were verified for a SBR Type III[7] latex.

Mixtures of latices of two different particle sizes were treated later by Maron and Madow. They were found to behave in much the same way as essentially monodisperse systems, except that they could pack more tightly, and hence were fluid at higher concentrations. S. H. Maron and Shui-Ming Fok[9] found the empirical equations to hold well for glass spheres in glycerol-water mixtures.

The present study has been concerned with the specific effects of particle size on the viscosity of some butadiene-styrene latices at the concentrations normally used in the industry. Viscosities were measured with a Brookfield[10] instrument. The details of preparation and concentration of these latices are given in another report by the authors.[11] The particle sizes were measured from electron micrographs made with the RCA[12] EMU-1 electron microscope. The techniques of preparation of the micrographs were conventional.

Calculation of Average Particle Spacing

The average spacing between uniform spherical particles may be found in this way. The total particle volume, v, is given by

$$v = \frac{4}{3} \pi r^3 N \tag{2}$$

where r is the particle radius, and N is the number of particles in the total volume V. The volume fraction F is defined as

$$F = \frac{v}{V} = \frac{4\pi r^3 N}{3 V} \tag{3}$$

The total volume, S, available to each particle is then

$$S = V/N = 4\pi r^3/3F \tag{4}$$

This volume may in general be expressed as the third power of the mean distance between particle centers, L, multiplied by a constant, C_1, which depends upon the shape of the volume:

$$S = C_1 L^3 \tag{5}$$

from which the mean distance between the centers of nearest adjacent particles may be expressed as shown in Equation 6.

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[1]Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 14, 1958.
[2]*J. Colloid Sci.* 5, 404 (1950); 8, 367 (1935).
[3]*Ibid.*, 6, 528 (1951).
[4]S. H. Maron, B. P. Madow, I. M. Krieger, *Ibid.*, 6, 584 (1951).
[5]S. H. Maron, B. P. Madow, *Ibid.*, 8, 130 (1953).
[6]A former GR-S latex designation for a 30/70 styrene-butadiene-copolymer polymerized in a persulfate system using sodium rosinate soap and stabilized with potassium oleate. The particle size was about 2,000 A.U.
[7]A former GR-S latex designation for a 50/50 styrene butadiene copolymer polymerized in a persulfate system with potassium rosinate soap. The particle size was about 1,100 A.U.
[8]*J. Colloid Sci.*, 8, 300 (1953).
[9]*Ibid.*, 8, 540 (1953).
[10]Brookfield Engineering Laboratories, Inc., Stoughton, Mass.
[11]RUBBER WORLD, 138, 6, 877 (1958).
[12]Radio Corp. of America, New York, N. Y.

The Effect of Particle Spacing on Latex Viscosity

From the simple geometric considerations of particle size and mean particle spacing, a relation between particle sizes in synthetic latices and the concentration limited by viscosity has been deduced, for substantially monodisperse systems.

An approximation to the Brookfield viscosity vs. concentration relation has been made from the mean particle spacing, using only one arbitrary constant.

A packing constant which holds its value well for a range of essentially monodisperse latices has been defined. It was found that it could be evaluated in any case from the volume concentration of polymer at which the viscosity increased beyond measure. This volume concentration has been found very close to 74% for latices of uniform particle size.

For latices having two principal sizes of particles, the packing constant assumed values corresponding generally to closer packing.

The use of the packing constant determined from the limiting concentration permitted a satisfactory fit between the viscosity-concentration curves for mixed latices, experimentally determined and deduced from particles spacing data, with the use of one arbitrary constant in this instance also.

$$L = \sqrt[3]{\frac{S}{C_1}} = r\sqrt[3]{\frac{4\pi}{3C_1F}} \qquad (6)$$

This assumes that for a large number of particles the spaces between may be treated as though they were all the same shape. This assumption would have no validity for any small group of particles.

The mean distance from the surface of any particle to the surface of its nearest neighbor must be two particle radii less than the corresponding center-to-center distance. If the surface-to-surface separation is represented by δ, then,

$$\delta = L - 2r \qquad (7)$$

or

$$\delta = r\sqrt[3]{\frac{4\pi}{3C_1F}} - 2r \qquad (8)$$

If the constant $\frac{4\pi}{3C_1}$ be represented by C_2, then

$$\delta = r\left(C_2\sqrt[3]{\frac{1}{F}} - 2\right) \qquad (9)$$

A close-packed array of spheres in contact has about 26% void space, or a volume fraction of about 74%. A value for C_2 can be deduced by placing δ equal to zero and solving Equation 9 for C_2. Thus:

$$C_2 = 2\sqrt[3]{F} \qquad (10)$$

If the volume fraction, F, then be set equal to 0.74, C_2 is found to have a value of 1.8089. This constant might be called a "packing" constant since its value obviously depends upon the manner in which the individual particles fit together. It would take on a different value for arrays of spheres which were widely different in size, or for particles of non-spherical shape. When it is applied to arrays of particles not in contact, there is implied the assumption that the nature of the packing is the same as that of the particles when they are in contact. The mean surface separation in a system of uniform spherical particles diminishes rapidly as the volume concentration is increased, as Figure 1 shows.

In real cases the particles are always distributed in size about some mode. Thus, r should, in general, be replaced by $\bar{r}_v$, the volume-average radius, defined by

$$\bar{r}_v = \left(\frac{\Sigma nr^3}{\Sigma n}\right)^{\frac{1}{3}} \qquad (11)$$

making equation (9)

$$\delta = \bar{r}_v\left(C_2\sqrt[3]{\frac{1}{F}} - 2\right) \qquad (12)$$

Further, as Maron, Madow, and Krieger[4] have pointed out, the surfaces of the particles are probably separated by twice the length of the adsorbed soap molecule (2λ) even at the highest concentration.

Calculation of Limiting Polymer Concentration

The curves relating viscosity to concentration show an extremely steep rise at the upper end, becoming essentially asymptotic to a vertical line representing the concentration for infinitely high viscosity. The volume fraction at which this occurs is here called the "limiting volume fraction" and is represented by F_L. The particles may be supposed at this concentration to be separated by only the length of two soap molecules. If the surface-to-surface separation, δ, then be replaced by 2λ, Equation 12 becomes

$$2\lambda = \bar{r}_v\left(C_2\sqrt[3]{\frac{1}{F_L}} - 2\right) \qquad (13)$$

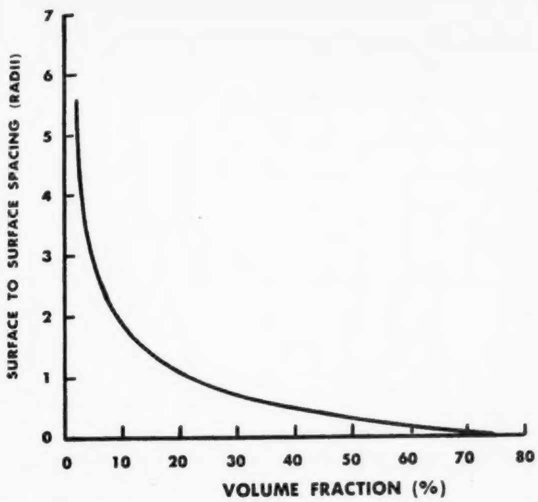

Fig. 1. Particle spacing as a function of volume fraction

which may readily be solved for F_L:

$$F_L = \left[\frac{C_2}{\frac{2(\lambda + 1)}{\bar{r}_v}} \right]^3 \qquad (14)$$

Upon the assumption that, in the limiting case, the particles will be close-packed, a value of 1.8089 can be used for C_2. The length of the oleate ion given by Maron, Madow, and Krieger is 27.5 A.U.

Table 1 compares values of F_L for several latices, computed from Equation 14 with experimental values, measured on the Brookfield instrument. The value of $\bar{r}_v$ was measured experimentally in each case. All the latices used in this report were 30/70 styrene-butadiene copolymers of conventional types. The polymer densities in all cases were taken as 0.93 gm/cm^3, and no corrections were made for small amounts of catalyst and other materials other than polymer and emulsifier.

The computed values of F_L in Table 1 were taken from a plot of Equation 14 shown as Figure 2, rather than individually calculated. The experimental values for F_L were estimated from the viscosity-concentration curves. These limiting concentrations were convenient to work with, since they did not depend upon the nature of the viscosimeter to any marked extent. The rapid rise of the limiting concentration with particle size, as displayed in Figure 2, may be responsible for the viscous phase which some latices pass through during polymerization. At relatively low polymer concentration, large numbers of small particles may be present; this would result in small average spacings and hence in high viscosity. Coalescence of particles during this phase, by reducing the number of particles, would lower the viscosity.

TABLE 1. LIMITING CONCENTRATION OF SYMPATHETIC LATICES

Sample	$\bar{r}_v$ (A. U.)	F_L (Mass) (Eq'n 14) (%)	F_L (Experimental) (%)
X-758	830	62.7	63
F-5	970	63.4	65
Type V	1530	65.2	66
137 (144)	1840	66.0	65.9
134 (156)	830	62.7	61.8
135	540	60.5	59.5

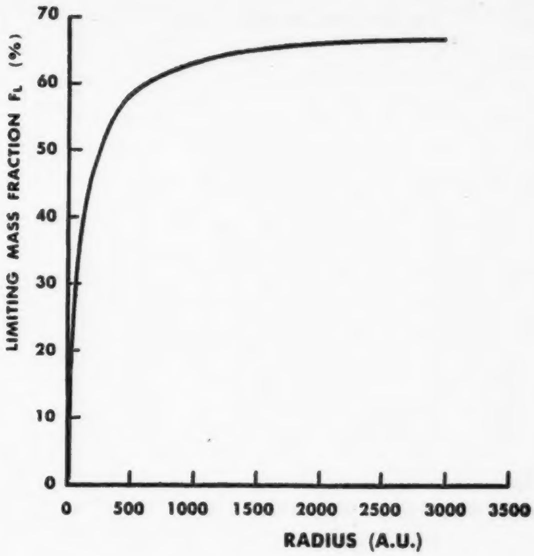

Fig. 2. Limiting mass fraction of polymer as a function of particle radius

Viscosity-Concentration Relation for Single Latices

In simple cases it can readily be seen that the probability of collision between particles in a shearing process (i.e., a movement of the fluid which produces a velocity gradient) varies directly with the projected area of the moving particle and inversely as the area through which it must pass.

The projected area of any particle is given by $\pi(\bar{r}_v + \lambda)^2$. The probability that a collision will occur must be proportional to this area. The area between particles in any plane may be represented by $C(\delta - 2\lambda)^2$, where C is a constant, the value of which depends on the shape of the area. The probability of collision must be inversely proportional to this area. If the viscosity of the dispersion is increased incrementally by each collision, one may express it as a function of the viscosity of the liquid (η_o) and the total collision probability:

$$\eta = \eta_o K \frac{\pi(\bar{r}_v + \lambda)^2}{C(\delta - 2\lambda)^2} + \eta_o \qquad (15)$$

where K is a constant, and δ is determined from Equation 12.

If we let $\frac{\pi K}{C}$ be represented by C_3, Equation 15 becomes

$$\eta = \eta_o C_3 \frac{(\bar{r}_v + \lambda)^2}{(\delta - 2\lambda)^2} + \eta_o \qquad (16)$$

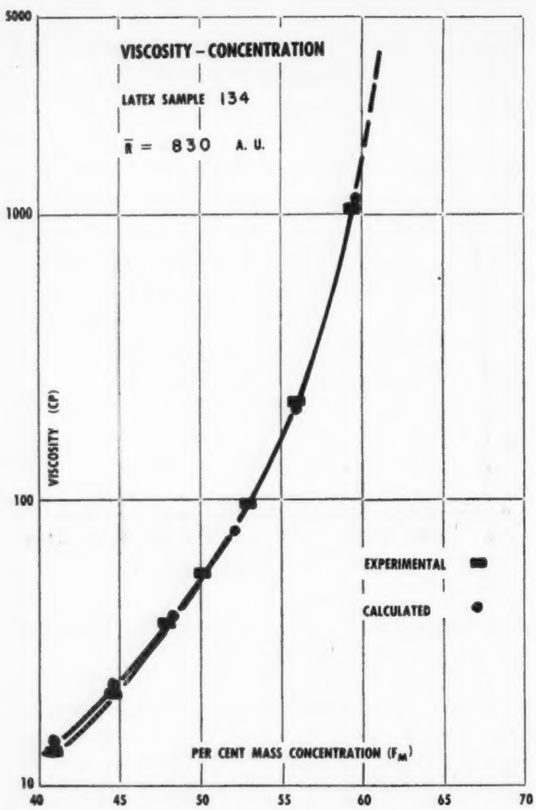

Fig. 3. Experimental and calculated viscosities vs. % mass concentration for 830 A.U. average radius latex

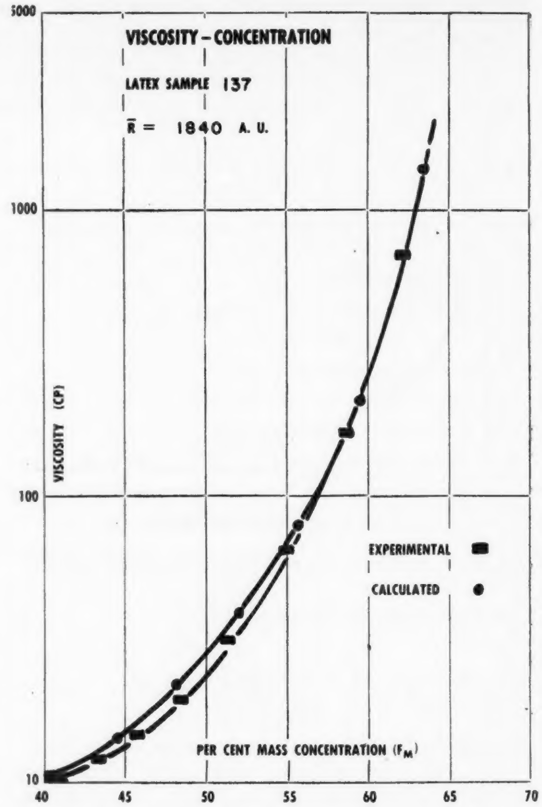

Fig. 4. Experimental and calculated viscosities vs. % mass concentration for 1,840 A.U. average radius latex

In very dilute dispersions, δ becomes large compared with $\bar{r}_v$; and the second term approaches zero. The latex viscosity η then approaches the viscosity of the liquid, η_0.

The constant C_3 would not necessarily be the same for all latices, but would depend upon the increase in viscosity produced by individual collisions. This would in turn depend upon the particle size and upon the distribution of sizes. Thus C_3 may be called an interaction constant, since it represents the change in viscosity occasioned by one average collision.

The term "viscosity" in reference to latex is not used in the absolute sense, since latex at high concentration is not Newtonian. It implies only the shear force required to maintain some substantially constant rate of shear.

The quality of fit given by Equation 16 is shown in Figures 3 and 4. Values of C_3 were determined by solving Equation 16 for C_3 and placing in the equation the experimental values of viscosity and δ at 55.8% mass concentration or 60% volume fraction. Once C_3 had been determined in this way for each latex, the viscosities at all other concentrations were computed from Equation 16. The values for C_3 thus determined are given in Table 2, which gives constants for both single and mixed latices.

TABLE 2. CONSTANTS FOR SINGLE AND MIXED LATICES

Sample	$\bar{r}_v$ (A. U.)	$\bar{R}_v$ (A. U.)	C_3	C_2	Calculated F_L (Mass %)	Experimental F_L (Mass %)
137	1840		1.01	1.809	65.9	66.0
134	830		1.34	1.809	61.8	62.0
135	540		2.24	1.809	59.5	61.0
50/50 137/135		670	1.13	1.874		67.9
76/24 137/135		850	0.74	1.851		67.0
50/50 137/134		1015	0.57	1.803		63.0
76/24 137/134		1230	0.54	1.809		64.5
50/50 134/135		630	3.09	1.829		62.5
76/24 134/135		700	1.30	1.828		63.5

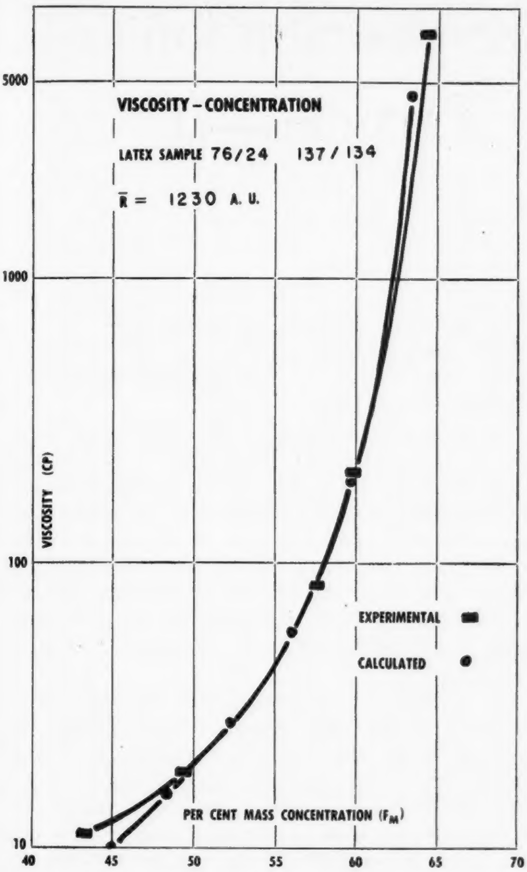

Fig. 5. Experimental and calculated viscosities vs. % mass concentration for mixture containing mass ratio of 76/24 for the two components. Volume-average radius equal to 1230 A.U. (See Table 2)

Viscosity-Concentration Relations for Mixtures

The limiting concentration for mixtures of particles in which there was a wide disparity in size depended upon the manner of packing, which could not be determined independently, as in the case of the monodisperse systems. It was necessary to compute a new value for the packing constant C_2 for each mixture, using the experimental values of F_L and $\bar{R}_v$.

The volume-average radius, $\bar{R}_v$, of two families of particles in a mixture may be approximated by considering each family to be of uniform size. From the definition of volume-average radius,

$$\bar{R}_v = \sqrt[3]{\frac{\Sigma nr^3}{\Sigma n}} \qquad (11)$$

one can write,

$$\bar{R}_v = \left[\frac{n_1 r^3_1 + n_2 r^3_2}{n_1 + n_2}\right]^{1/3} \qquad (17)$$

where n_1 is the number of particles in the mixture having radius r_1, and n_2 is the number having radius r_2. If the ratio of the mass of particles in family (1) to the mass of particles in family (2) is represented by ϕ, all particles having the same density, then

$$\phi = \frac{n_1 r_1^3}{n_2 r_2^3} \qquad (18)$$

Eliminating the n's from Equation 17 by the substitution of 18 and rearranging yields

$$\bar{R}_v = \left[\frac{r_1^3 r_2^3 (\phi + 1)}{\phi r_2^3 + r_1^3}\right]^{1/3} \qquad (19)$$

The values of $\bar{R}_v$ were thus computed for mixtures containing mass ratios of 50/50 and 76/24 for the two components, and the radii shown in Table 2.

Solving Equation 14 for C_2 yields

$$C_2 = \frac{2(\lambda + \bar{R}_v)\sqrt[3]{F_L}}{\bar{R}_v} \qquad (20)$$

Placing $\bar{R}_v$, calculated from 19 and the experimental value of F_L in 20 gives the packing constants C_2 shown in Table 2.

The cases in which the ratio of particle sizes in the two families was about one-half showed the poorest packing, that is, the smallest packing constant. Ratios smaller and larger than this produced packing constants larger than that for the monodisperse systems. Much more data would be required to indicate a more definite pattern of behavior for such mixtures.

As in the case of monodisperse latices, C_3 was evaluated by fitting at 60% volume fraction. The quality of fit in these cases is represented in Figure 5.

The logarithmic scale was chosen for convenience in plotting, although such a scale tends to emphasize the error at the lower end.

In general, it should be noticed that the interaction constant C_3 increases as the particle size is reduced. When both large and small particles are present, the interaction constant may be smaller than that for either of the components alone.

From the present data, however, no completely consistent general relation between the amount and sizes of the components and the interaction constant can be seen.

Summary and Conclusions

From simple considerations of particle size and spacing a relation between particle size and limiting concentration has been defined which has a fixed value for essentially monodisperse systems. A relation between particle size, particle spacing and viscosity has been shown. An interaction constant expressing particle-particle interference in latices has been defined and evaluated for several systems. It has been found that the packing constant assumes a value for mixtures of latices of different particle sizes which depends upon the ratio of sizes.

Acknowledgments

Thanks are due to J. W. Liska and E. E. Hanson for help and encouragement in the work herein described, and to The Firestone Tire & Rubber Co. for permission to publish this work.

Pore Sizes and Pore Size Distribution In Reinforcing Pigment Particles—II*

By ANDRIES VOET
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THE following installment concludes the informative article on pore sizes and pore size distribution which was begun in our October issue.

Calculation of Class I Capillary Sizes and Size Distribution

The B.E.T. equation permits the calculation of the gas volume V_m adsorbed at the pressure where the monolayer is completed. By dividing the amount of gas taken up at various relative pressures by V_m, one obtains the values for n, the statistical average number of gas molecule layers adsorbed on the surface at the corresponding pressures. Table 2 lists these n values obtained for various non-porous blacks.

These n values are in excellent accord with n values for non-porous surfaces, published by Pierce and Smith (7).† However, the n values at higher relative pressures given by these authors (not indicated here) are too high since inter-particle capillarity was not taken into account.

Thus for spherical particles two separate criteria exist for the presence or absence of capillaries. Non-porous pigments show a roughness factor of 1 and n values as shown in Table 2. The conclusions from both methods are in agreement for carbon blacks. It was observed that for carbon blacks with a roughness factor larger than unity, the n values at relative pressures in the medium range were lower than those for non-porous pigments. For a relative pressure of 0.15 all blacks, except Carbolac 1, showed an n value equal to 1.15, the value for the average layer thickness of a non-porous black.

* Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 16, 1958.

† Numbers in parentheses refer to Bibliography items which appear on page 73 of our Oct., 1958, issue.

[6] The subscript np, used in equation E and elsewhere, refers to values for non-porous pigments.

TABLE 2. AVERAGE LAYER THICKNESS OF ADSORBED NITROGEN ON NON-POROUS BLACKS

Relative Pressure	n Values EPC Channel	SRF	Pierce (7) Non-Porous n
0.15	1.15	1.15	—
0.20	1.22	1.22	1.22
0.30	1.38	1.38	1.38
0.40	1.56	1.55	1.56
0.50	1.78	1.77	1.78

The adsorption isotherm for nitrogen at −196° C. permits the calculation of pore sizes and pore size distributions of Class I capillaries, based upon the following considerations.

The Class I pores are very small, of the order of a few molecular diameters of nitrogen. Consequently, as previously discussed, they will fill up rapidly during the adsorption process. It now appears justified to neglect in first instance, in view of the comparatively large surface areas and the small volumes of the Class I capillaries, the amount of nitrogen used to complete the filling of the capillaries which had already been filled in part by the process of multilayer adsorption.

On the basis of this assumption, the calculations are quite simple. The decrease in adsorption, as compared to the ideal non-porous pigment is then in each relative pressure interval necessari'y caused by a reduction in available surface area. This area is removed from the total surface area because it is the area of the pores filled with nitrogen in this interval, which cannot adsorb any additional nitrogen.

At the relative pressure of 0.20 many reinforcing pigments appear to have an n value of 1.22 which is equal to the non-porous value. Since a relative pressure of 0.20 corresponds to a pore diameter of 22 Å, according to Wheeler's combined multilayer adsorption and capillary condensation theory (4), as calculated by Barrett *et al.* (5), it is obvious that no pores smaller than this diameter exist in any of these pigments. Increasing the relative pressure from 0.20 to 0.30, the n value for non-porous pigments was found at 1.38, indicating that the total quantity of nitrogen taken up per gram of non-porous pigment[6] in this interval is equal to:

$$(\Delta V_{np})_{0.2}^{0.3} = 1.38\, V_m - 1.22\, V_m = 0.16\, V_m \qquad \text{(E)}$$

For a material with Class I capillaries in this range, the statistical average layer thickness n_p is below 1.38, and ΔV_p, the amount of gas taken up per gram of pigment, is smaller than ΔV_{np} and is thus below 0.16 V_m in the 0.20-0.30 relative pressure range.

Neglecting, as previously indicated, the amount of nitrogen required to fill up the small Class I capillaries in the interval, we may calculate from the reduction in nitrogen uptake (as compared with a flat surface of equal area) which fraction of the surface is not participating any longer in this relative pressure interval in the process of multilayer gas adsorption.

TABLE 3. PORE CALCULATIONS FOR CARBOLAC 1

P/P_0	Pore Diam. Å	n_{sp}	n_p	Δn_{np}	Δn_p	Porous Fractions (Cumulative)	Porous Fraction of Surface
>0.10	>17					0.00	0.00
0.10	17	1.07	1.07				
				0.08	0.07	0.12	0.12
0.15	19.5	1.15	1.14				
				0.07	0.05	0.29	0.17
0.20	22	1.22	1.19				
				0.16	0.10	0.38	0.09
0.30	27.5	1.38	1.29				
				0.18	0.09	0.50	0.12
0.40	33.5	1.56	1.38				
				0.22	0.10	0.55	0.05
0.50	41.5	1.78	1.48				
<0.50	<41.5					0.55	0.00

TABLE 4. CUMULATIVE PORE AREA FRACTION AND PORE DIAMETER

			EPC Channel S = 97.8		MPC Channel S = 118.9	
Relative Pressure	Pore Diameter Å	n Non-Porous (Pierce)	n	Cumul. Pore Area Fraction	n	Cumul. Pore Area Fraction
0.15	19	1.15	1.15	0	1.15	0
0.20	21	1.22	1.22	0	1.22	0
0.30	26	1.38	1.38	0	1.36	0.12
0.40	32	1.56	1.56	0	1.51	0.17
0.50	40	1.78	1.78	0	1.74	0.18

	Residual Silica from Calcined Clay S = 367.4		Monarch 74 S = 367.9		Zeolex 23 S = 60.7	
Relative Pressure	n	Cumul. Pore Area Fraction	n	Cumul. Pore Area Fraction	n	Cumul. Pore Area Fraction
0.10	....	....	1.07	0	....	....
0.15	....	....	1.15	0	....	....
0.20	1.22	0	1.21	0.14	1.22	0
0.30	1.29	0.56	1.33	0.25	1.38	0
0.40	1.34	0.69	1.465	0.25	1.53	0.17
0.50	1.37	0.86	1.63	0.25	1.71	0.18

	Cab-O-Sil S = 193.8		Silica S = 255.8		Residual Silica from Clay S = 60.1	
Relative Pressure	n	Cumul. Pore Area Fraction	n	Cumul. Pore Area Fraction	n	Cumul. Pore Area Fraction
0.20	1.22	0	1.22	0	1.22	0
0.30	1.36	0.12	1.32	0.38	1.36	0.12
0.40	1.50	0.22	1.43	0.39	1.51	0.17
0.50	1.65	0.32	1.56	0.41	1.69	0.18

TABLE 5. TOTAL SURFACE AND PORE AREAS OF REINFORCING PIGMENTS

Pigment	Mfr.	Total Area, m^2/g	Flat Area, m^2/g	Total Pore Area, m^2/g	Total Pore Area, %
Channel EPC	Huber	97.8	97.8	0	0
Channel MPC	Huber	118.9	97.5	21.4	18
Carbolac I	Cabot	1052	473	579	55
Monarch 74	Cabot	367.9	275.9	92.0	25
Zeolex 23	Huber	60.7	49.8	10.9	18
Cab-O-Sil	Cabot	193.8	131.9	61.9	32
Silica	Exp.	255.8	150.9	104.9	41
Residual silica uncalcined	Exp.	60.1	49.3	10.8	18
Residual silica calcined	Exp.	367.4	51.4	316.0	86

Equating this with the area of the capillaries, we may then calculate the fraction of the total surface area contained in the capillaries. Thus, if in the relative pressure interval 0.2-0.3, ΔV_p were only 0.08 V_m (half the value of ΔV_{np}), then only half the surface area would be available for multilayer gas adsorption, and the other half would be contained in capillaries which have filled in this pressure interval.

Accordingly, the surface area contained in the filled capillaries A_p may be derived from the following equation for Class I capillaries in the relative pressure interval 0.20-0.30:

$$\frac{A_p}{S} = \frac{(\Delta n_{np})^{0.3}_{0.2} - (\Delta n_p)^{0.3}_{0.2}}{0.16\ V_m} \qquad (F)$$

For each interval the following equation will be valid:

$$\frac{A_p}{S} = \frac{\Delta n_{np} - \Delta n_p}{\Delta n_{np}} \qquad (G)$$

This equation permits the calculation of pore sizes and pore size distribution for each pigment over the entire significant range in steps of any desired magnitude. As an example, Table 3 shows data for Carbolac 1, together with the relative pressures and the corresponding pore diameters as calculated according to Barrett *et al.* (5).

The column marked Δn_{np} shows the change in statistical average layer thickness for a non-porous pigment in the intervals indicated; while the column marked Δn_p shows the corresponding, smaller changes for Carbolac 1. By applying equation (G) to each relative pressure interval, the cumulative pore fraction

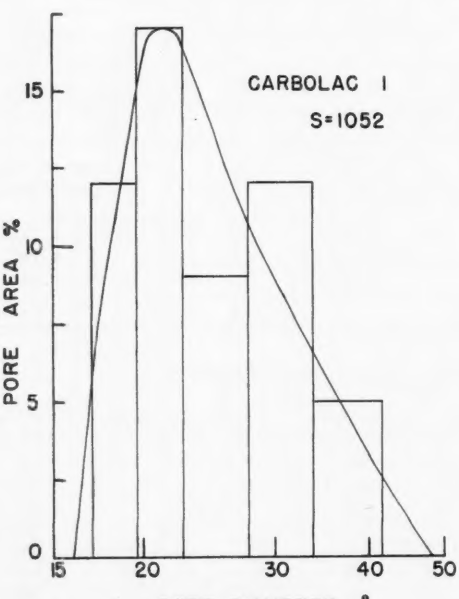

Fig. 6. Histogram of pore size distribution in Carbolac I

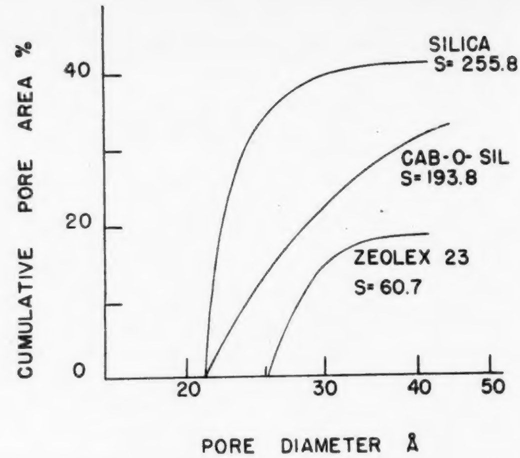

Fig. 7. Pore size distribution curves for silica pigments

is obtained. Pore fractions in each interval may now be calculated, as indicated in the last column. The data of the last column are shown in Figure 6.

Table 4 indicates n values and corresponding pore areas in different intervals calculated as above.

In view of the form of the Kelvin equation, cumulative pore areas have been plotted against pore diameters in Figures 7, 8, 9 and 10 for various reinforcing pigments as a semi-log plot.

Table 5 indicates the total surface area as well as the areas of the flat surface and the areas contained in the Class I capillaries.

Pore size distribution curves for three silica pigments, showing marked differences among them, is given by figure 7. The silica, a hydrated precipitated silica, has a considerable number of small pores and in view of the absence of any desorption hysteresis in the relative pressure range of 0.5-0.8 it appears that large pores are not present. Cab-O-Sil has comparatively fewer, but somewhat larger pores. Zeolex 23, a sodium-aluminum silicate of a larger particle size, has few pores in the 26-32 Å range.

Figure 8 shows the pore size distribution curves for three carbon blacks. The data reveal the influence of the process of oxidation on pore formation in the pigment particles. Thus, while the EPC black has no pores whatsoever, MPC black has pores in the 26-32 Å diameter range, totaling a pore surface area of about 21 m^2/g. The more oxidized Monarch 74 black has pores in the 19-32 Å diameter range, having a total surface area of about 92 m^2/g. Finally, highly oxidized Carbolac 1 has pores in the 17-32 Å diameter range, of a total surface area of about 579 m^2/g. Obviously progressive oxidation creates more and smaller pores in the particles.

No Class II pores were found in any of these particles. Nitrogen desorption hysteresis found in Carbolac 1 at higher relative pressures is caused by external capillaries.

An interesting example is found in Figure 9,

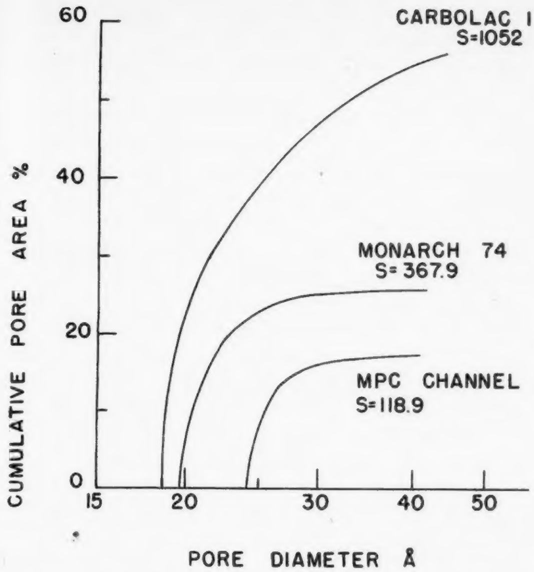

Fig. 8. Pore size distribution curves for blacks

where pore size distribution curves are shown for residual silica obtained from the acid treatment of kaolin clay. The silica residue from uncalcined clay has a total surface area of 60.1 m^2/g. It has few pores in the 21-32 Å range. The silica residue obtained from calcined clay, however, has a surface area of 367.4 m^2/g. The data given indicate that nearly 86% of the surface area is contained in small pores. The effective non-porous area is therefore, only about 51 m^2/g.

The residual silica partic'es obtained from calcined clay are visible as roughly spherical particles on an electron microscope shadowgraph and are generally of a diameter of about 200-250 Å. The particles of silica obtained as a residue from uncalcined clay are not greatly different from those obtained from calcined clay as shown by an electron microscope platinum shadowgraph. The particle sizes are of the same order of magnitude, making it obvious that the large surface area of the latter particles must be due to an internal porous structure.

An independent confirmation of the presence of pores in the residue from calcined clay was found in specific gravity measurements in rubber and in helium as indicated in Table 6.

Obviously, large rubber molecules cannot enter the pores of this porous pigment, while small helium molecules can and do enter without difficulty, as is indicated by the specific gravity data. In addition, the oil absorption of both residues from calcined and uncalcined clays is about equal, demonstrating that the pores are too small to allow the large triglyceride molecules to enter.

In the rare instances where Class II pores are also present in reinforcing pigments, the calculations for relative pressures above 0.50 may be made from the desorption branch of the isotherm, as indicated previously (5-6). An example is given in Figure 10 for Bentonite clay. The newly developed method is also used for the few Class I pores. It is recognized that the validity of this approach is actually limited to spherical particles, but it is used here as a demonstration.

TABLE 6. SPECIFIC GRAVITIES OF RESIDUAL SILICA

Silica Residues from	Specific Gravity d^{25}_4 in: Rubber	Helium
Uncalcined clay	2.0704	2.079
Calcined clay	1.9937	2.073

Discussion

The method of calculation of pore areas given for Class I capillaries differs basically from accepted methods of calculation of Class II capillaries. This is justified by their difference in behavior.

From the experiments indicated in Figure 5 it appears that when a pigment powder is compressed into a plug, thereby creating external Class II capillaries, the effect is invariably to bring about an increase in the amount of adsorbed gas at higher pressures. Only when this pore space is nearly filled, is a decrease observed in the pressure range close to saturation (12).

Without exception, the pigments with Class I pores show an immediate decrease in the quantity

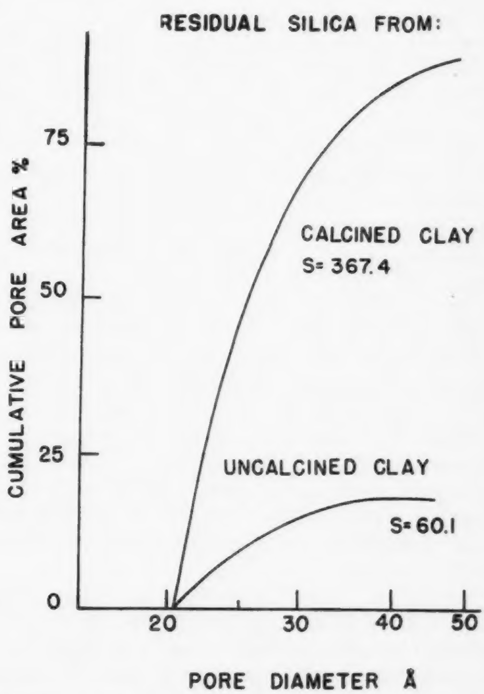

Fig. 9. Pore size distribution curves for residual silica pigments from clay

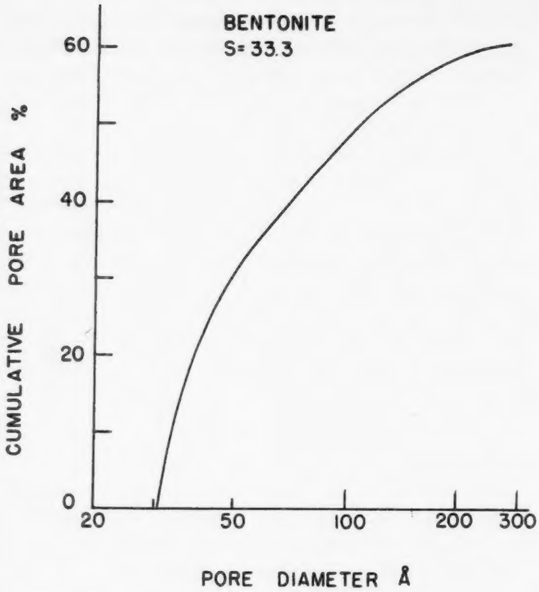

Fig. 10. Pore size distribution for Bentonite

of gas adsorbed as compared with non-porous pigments. Treatment of pores as Class II capillaries would require an increase in nitrogen adsorption. For instance, a flat surface of 1 m^2 would take up, if at —196° C. the relative pressure were increased from 0.20 to 0.30, a quantity of nitrogen equal to a liquid volume of 0.576×10^{-4} cm^3, as may be calculated from the increase in n value for non-porous surfaces. The same area, if consisting of Class II capillaries which would fill completely in the pressure interval considered, would require a quantity of nitrogen of 2.03×10^{-4} cm^3 to fill up, as may be calculated on the basis of Wheeler's theory (4) as applied by Pierce (6). This would indicate an increase in nitrogen requirements, as is actually found experimentally only for Class II capillaries. The fact that with Class I capillaries a decrease in nitrogen requirements is always found emphasizes the differences in behavior.

The procedure followed, by considering the Class I capillaries to be filled during the adsorption process without taking any additional nitrogen requirement into account for the actual filling of the capillaries, is furthermore justified by the consideration that a statistical average layer thickness, significant on a flat surface, loses its meaning in a very small capillary. Thus, while at a relative pressure of 0.15 the statistical average number of layers of nitrogen molecules adsorbed is 1.15, the number must be either 1 or 2 in a given spot.

In a Class I capillary both walls together would adsorb about three nitrogen molecules; the largest dimensions of each are about 4.5 Å. The capillary is so narrow (19.5 Å) that there is barely space for one additional nitrogen molecule. When captured, it would be strongly held by both walls and could block the pore, which would then act as if it were filled. Thus it is easily seen that the quantity of nitrogen required for filling narrow Class I pores is negligible.

It must be emphasized that the method outlined above is to be considered merely a semi-quantitative approach and is valid only for pigments with spherical particles, for which the roughness factor approach is applicable. Besides the inherent limitations of such calculations, the assumptions of the validity of the Kelvin equation, and the idealization of the pore shape to a cylindrical form, an additional difficulty is the lack of precise knowledge of n values. Thus, if a slight deviation were found in the n values from those given in Table 2 for spherical non-porous pigments, such a small difference could not, beyond any doubt, be related to the presence of pores. Since differences in n values are comparatively small, the experimental uncertainties in the non-porous n values severely limit the accuracy of the results.

For non-porous, non-spherical particles the n values are generally higher than those for non-porous spherical particles. Thus, n values for Graphon, a graphitized channel black, are considerably higher than the n values of the original channel black, owing to the change of the spherical channel black particles into the irregular polyhedra of Graphon during the process of graphitization. Equally, the n values for kaolin clay particles, which are generally hexagonal platelets, are higher than for non-porous spherical particles of similar areas.

Calculations of pore sizes could presumably be made for systems of non-spherical particles on the basis of the approach indicated above, if a method were to exist to indicate clearly the absence of pores in systems of non-porous, non-spherical particles, since the roughness factor approach is not applicable for this case. Such a method however, is not presently known.

The results of the approach outlined above appear to be justified for spherical particles, and the quantitative conclusions are in full agreement with qualitative results previously obtained (13-14). Dannenberg and Boonstra's estimation of pore sizes of oxidized carbon blacks (15) are in complete accord with the above results, provided a correction is made for chemisorbed oxygen (14).

Summary and Conclusions

Since pores in reinforcement pigments may form expensive "traps" for rubber chemicals, without contributing to reinforcement, it is desirable to detect the presence of small pores in the pigment particles. Existing methods permit only the analysis of pores of a diameter larger than 40 Å, which is above the important range in the extremely small pigment particles used in today's elastomers. A new approach is presented, allowing evaluation of smaller significant pores of the 18-40 Å diameter range, in spherical particles. This approach is based upon a stepwise analysis of the reduction in nitrogen adsorption by the pigment in the presence of smaller pores, as a result of their elimination from continued multilayer adsorption by their complete filling.

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NEWS of the RUBBER WORLD

The United States Tariff Commission will make its final report to Congress in January on modernization of the 30-year-old tariff schedule. Included is a new definition for "rubber" because of the importance for classification purposes in international trade. A revision of this definition by the industry's technical experts is likely before adoption.

The Senate Government Operations Committee will launch a survey of federal science activities in January that should result in still further improvement in the government's scientific and technical information services. The Military Reorganization Act of 1958 created the Office of Director of Research and Engineering within the Defense Department, which will supervise research and development expenditures estimated to total more than $2.7 billion in fiscal 1959.

E. J. Thomas has been elected chairman of the board of the Goodyear Tire & Rubber Co., succeeding P. W. Litchfield, who becomes honorary chairman. Thomas continues as chief executive officer of Goodyear.

John L. Collyer has relinquished the position of chief executive officer of The B. F. Goodrich Co. to J. Ward Keener, but Collyer will continue as chairman of the board of directors.

James E. Trainer, executive vice president of the Firestone Tire & Rubber Co., pointed out in a recent speech that shortage of investment capital, lack of trained personnel, and the need of even greater technical knowledge are forces working against increased automation in industry. The international race for scientific and technological supremacy, projections of our population growth, the necessity to reduce costs to expand markets, etc., are forces working toward increased automation.

The 43rd annual meeting of the Rubber Manufacturers Association in New York on November 20 will feature appraisals of the 1959 outlook on the business, legislative, and collective bargaining fronts.

MEETINGS and REPORTS

Akron U Rubber Chemistry Celebration; Five Hall of Fame Members Selected

Several hundred scientists, engineers, and educators interested and engaged in the field of rubber chemistry met on the campus of the University of Akron in Akron, O., on October 3 and, joined by faculty, students, and alumni, celebrated the "Fiftieth Anniversary of the Teaching of Rubber Chemistry" at the University.

The all-day program began with an address, "Is This the Nuclear or Unclear Age?", by Norman P. Auburn, president of the University, at a morning convocation in Memorial Hall. Following this address, honorary degrees of Doctor of Science were conferred on Alan T. Waterman, director of the National Science Foundation, and G. Stafford Whitby, consultant on rubber research and professor emeritus of rubber chemistry at the University of Akron.

After lunch, Maurice Morton, director of the Akron University Institute of Rubber Research, led an afternoon symposium on "Macromolecules and Elastic Networks" in Memorial Hall. Participating in the symposium were Dr. Whitby; Peter Debye, 1936 Nobel Award winner and professor emeritus of chemistry at Cornell University; and Peter J. Flory, executive director of research, Mellon Institute.

Establishment of the Rubber Science Hall of Fame followed the symposium, with the naming of the first members, chosen by a committee from the Division of Rubber Chemistry, American Chemical Society. Thomas Sumner, head of the Akron U chemistry department presided over this portion of the program.

An evening banquet in the University's new Student Center concluded the day's program and featured Dr. Waterman as the principal speaker.

Harry P. Schrank, executive vice president, Seiberling Rubber Co. and vice chairman of the Akron U board of directors served as organizational chairman for the event. Members of the committee for general organization[1] and the honorary committee[2] consisting of six of Akron's major rubber industry leaders have been reported previously.

[1]Rubber World, Aug., 1958, p. 762.
[2]*Ibid.*, Sept., 1958, p. 908.

Banquet speaker Alan T. Waterman *(left)*, being introduced by Mr. Schrank

Morning Convocation

In his address at the morning convocation Dr. Auburn said that as we pause to observe the progress in rubber science over the past half-century, we would do well to look ahead in this nuclear age and inquire whether this is the nuclear age or the unclear age.

The emphasis we have placed on scientific development has made this a nuclear age, and we can not and dare not reverse the trend. One penalty we pay for progress in this nuclear age is that the future seems terribly uncertain and unclear, but has not man's future always appeared unclear, Dr. Auburn asked. He then suggested a possible course of action aimed at taming the present-day scientific tiger and making him do our bidding.

We must continue to emphasize scientific instruction, research, and development, or mankind's progress will grind to a halt. In this scientific age all intelligent persons should know something of scientific methods. The science of human relations must be cultivated as assiduously as the physical sciences. Natural scientists should have a thorough grounding in the humanities and social sciences. Our intellectuals should be given the respect, the status, the prestige, and the economic security they need to do superior work. Finally, we should cultivate basic and theoretical research without expecting and demanding immediate practical results, Dr. Auburn concluded.

The speaker then reassured his audience by reviewing scientific achievement during the last 50 years and asking if anyone in 1908 would have thought such astounding developments could have been achieved.

In conclusion, Dr. Auburn added a seventh and most important point, that is, the need of divine guidance and inspiration to help make that which is good and excellent triumph.

Symposium on Macromolecules

Dr. Whitby, the first speaker at the afternoon symposium on "Macromolecules and Elastic Networks," took as his subject "A Fifty-Year Retrospect of Rubber Science." In 1860, Greville Williams discovered, in isoprene, the key to the chemical structure of rubber and to its synthesis, yet nearly 50 years passed before serious attempts were made to unlock the secret of the structure of the rubber molecule and to develop practical means of synthesizing rubber, Dr. Whitby said.

The two most important concepts developed in rubber science during the past 50 years are (1) the macromolecularity of rubber, which involves the idea that, contrary to what early workers thought, rubber does not consist of simple molecules on which colloidal characteristics are "superimposed," but that the colloidal properties of rubber are inherent in its macromolecularity; and (2) the formation in vulcanization of a chemically-bonded network between the macromolecules as an explanation of the elasticity of vulcanized rubber.

The two most important discoveries that have contributed to improvement in the quality of rubber goods during

At the pre-banquet reception sponsored by the Akron Rubber Group, *(left to right)*: J. P. Seiberling, Dr. Auburn, and H. J. Albrecht, chairman of the University board of directors

Norman P. Auburn

the last 50 years have been the development of organic accelerators and the use of carbon black for reinforcement. Among other subjects on which notable progress has been made are the composition and behavior of Hevea latex and the development of improved synthetic rubbers.

There are many good reasons for viewing any branch of science in its historical perspective, Dr. Whitby added. One of them is to induce in us a becoming modesty about the achievements of our own generation and a sense of our just indebtedness to our predecessors. Gratified though we may well feel about the present state of development of rubber science, and inadequate and even crude though we may think the ideas of our predecessors 50 years ago, we should not be unmindful of the chastening thought that many of today's ideas in rubber science will indubitably seem in turn inadequate and crude 50 years hence, Dr. Whitby concluded.

Dr. Debye, in discussing "Measurements of Macromolecules," included comments on viscosity as a measure of coil-dimensions and the inadequacy of Staudinger's rule. This discussion also covered statistics of the restricted random flight, coil-swelling and drainage, light scattering and osmotic pressure, angular dissymmetry of scattered intensity as a measure of coil-size, and the radius of gyration.

Dr. Flory, in connection with his paper on "Rubber Elasticity," declared that scientific investigations on the constitution of rubber, and especially on the remarkable property of high elasticity, form one of the most fascinating accounts in the annals of science. The record covers a period of a century and a half; it is intimately associated with the rise of structural organic chemistry and of kinetic and thermo-dynamic interpretations of the properties of matter. Scientific interest in rubber and rubber-like materials culminated in modern times in the formation of the statistical-kinetic theory of high elasticity—an outstanding achievement of polymer science.

The elasticity of rubber was recognized long ago to bear close phenomenological resemblance to the elasticity of gases, it was said. The correspondence is retained in modern interpretations and is strikingly illustrated by comparison of the rubber elasticity equation of state with the equation of state for gases. Manifestation of high elasticity is not confined to selected polymeric substances, but is in fact observed, under suitable conditions, in a wide variety of polymers including proteins.

More recently, attention has been focused on the deviations of rubber elasticity from ideality, stated Dr. Flory.

G. Stafford Whitby

These deviations are related to specific features of the polymer chain structure. The dynamic behavior of rubber-like materials has long been a favored subject for experimental investigation. Molecular interpretation in this area is vastly more difficult, and only very recently have partial theoretical advances been indicated.

Rubber Science Hall of Fame

Those elected to the Rubber Science Hall of Fame at Akron University, whose portraits will hang in the chemistry library, newly located in the Knight Chemical Laboratory, are as follows:

Charles Goodyear (1800-1860) — American inventor, who made possible the commercial utilization of rubber by his discovery of sulfur vulcanization in 1839, and who developed many new applications for rubber in commerce and industry.

C. Greville Williams (1829-1910)—English chemist, who in 1860 carried out a precise analysis of rubber and its decomposition products, during the course of which he discovered and named a new compound "isoprene" and recognized it as the basic unit of rubber and gutta-percha.

Carl O. Weber (1860-1905)—German-born chemist, who was the first to carry out a scientific study of vulcanization and of the chemistry of rubber in general, and whose book "The Chemistry of India Rubber," in 1902, was a landmark in the scientific progress in this field.

Henri Bouasse (1866-1953)—French physicist, noted for his outstanding theoretical and experimental studies of the physics of rubber elasticity, whose work, in 1903-04, laid the basis for modern rubber physics.

Ivan I. Ostromislensky (1880-1939)—Russian-born chemist, noted for his pioneering work in polymerization and synthetic rubber, for his synthesis of butadiene from alcohol, and his discovery of non-sulfur vulcanizing agents.

Fiftieth Anniversary Banquet

At the fiftieth anniversary banquet in the University's new Student Center, Mr. Schrank presided and after the invocation by Rev. Roland C. Pickhardt, Protestant counselor of Akron U, introduced the guests of honor at the head table.

Dr. Auburn welcomed those present; then Dr. Sumner reviewed 50 years of instruction in chemistry at the University. Dr. Morton next made some comments about the Institute of Rubber Research.

Another highlight of the banquet was the presentation of a resolution on behalf of the board of directors of The Rubber Manufacturers Association, Inc., by its president, Ross R. Ormsby, commending the University of Akron "for embracing the science of Rubber Chemistry as a part of its curriculum in 1908 and for its wisdom

Peter J. Debye

in nurturing and expanding this department to the point that it has won international recognition in its special field of technology."

Dr. E. H. Cherrington, Jr., dean, Buchtel College of Liberal Arts, Akron U, introduced Dr. Waterman.

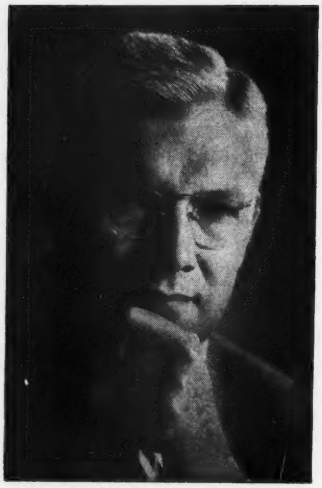
In discussing "Basic Research and Industrial Progress," Dr. Waterman reminded his listeners that the National Science Foundation has more than the usual interest in the matter of the teaching of rubber chemistry since NSF was designated by Congress in 1955 to assume responsibility for administering the federal program for basic research on synthetic rubber and for recommending the future role of the government in this area. In the course of this operation, NSF had occasion to become rather intimately acquainted with the outstanding role played by the University of Akron in the development of the great synthetic rubber research industry in this country, he added.

A second reason for special interest by NSF in Akron U's celebration stems from the Foundation's deep concern with the encouragement and support of basic research in the universities of the Nation, Dr. Waterman explained. Today, as never before, our technological effort, and indeed our very rate of industrial progress, depend in large measure upon the strength and soundness of the fundamental work, both theoretical and experimental that is going on in the universities.

Dr. Waterman then reviewed the transformation of our society which has come about through technological revolution since 1908. The whole history of science shows that progress in science as well as progress in technology are in jeopardy unless every attempt is made to continue free research and the freedom of investigators in research, he said. Such a program calls for financial support, and we must make sure that our financial support recognizes this importance, it was added.

We should encourage and support basic research to the limits of the capabilities of our scientists and engineers. By so doing, we make available to ourselves the full potentialities of all new discoveries of science. We should then give careful consideration to which of these potentialities we should emphasize and support for development and ultimate production. This is one of the best ways to control the national budget, Dr. Waterman declared.

In this way we should be able to maintain a sound economy and at the same time achieve our highest priority goals. To support basic research fully requires relatively modest amounts of money, except for capital facilities. It is in the stages of technology—applied research, development, and production—that the large costs occur. Therefore we are not jeopardizing the national economy in providing full support for



Gordon Campbell Buzzell

Paul J. Flory

basic research. In fact, we must go further and declare emphatically that unless basic research is adequately supported, we are certain to miss opportunities for development and application that may mean all the difference between success or failure in the race before us, whether for war or peace, the NSF director said.

In concluding his remarks, Dr. Waterman congratulated the University of Akron on the development of its impressive program in the field of rubber chemistry, saying that it typified at its very best the partnership between the scholarly research of the universities and the growth of a major American industry.

A handsome anniversary program distributed to those present includes remarks by Mr. Shrank and Dr. Auburn; photographs and information about the honorary committee of leading Akron rubber industry leaders; the "Past, Present and Future of Rubber Chemistry at the University of Akron," by Dr. Sumner; a "Behind the Scenes" review of the organization of the fiftieth anniversary of the teaching of rubber chemistry at Akron U, by Dr. Morton; photographs and comments on the achievements of the first five Rubber Science Hall of Fame members; a discussion of graduate work in rubber chemistry, by Dr. Cherrington; a review of the work of the Institute of Rubber Research, by Dr. Morton; comments on the Rubber Division Library by Dorothy Hamlen; and a description of the University.

Rubber & Plastics Division, ASME, N. Y. Program

The Rubber & Plastics Division of the American Society of Mechanical Engineers will hold a two-day technical meeting in New York, N. Y., December 3-4, as part of the annual meeting of the parent Society. The Division's program will feature papers containing new information on the technology of rubbers and plastics, including engineering, physical, and chemical data.

This meeting will be held at the Statler Hotel and is open to both members and non-members of the Society. R. W. Barber, Panelyte division, St. Regis Paper Co., is 1958 chairman of the Division, and R. D. Stiehler, National Bureau of Standards, is the secretary.

The program consists of three technical sessions, the first in the morning, the second in the afternoon of December 3, and the third in the morning of December 4. The chairmen and the vice chairmen for each of the three sessions are indicated below together with the titles and the authors of the papers to be presented.

Session No. 1

Chairman: D. M. Alstadt, Lord Mfg. Co., Special Products Division
Vice Chairman: R. F. Westover, Bell Telephone Laboratories, Polymer Mechanics Section

"Epoxy Resins and Their Application as Adhesives." D. Richart, S. M. Richardson, and C. F. Pitt, Bakelite Co.

"The Strength of Curved Glued Laminated Wood Timbers as Affected by Radius of Curvature and Lamination Thickness." William J. Finnoran, Timber Engineering Co.

"Control of Flexural Strength of Glass-Fiber Resin Laminated by Glass Surface Treatment and Theoretical Implications." Nicholas M. Trivisonno, B. F. Goodrich Research Center.

"Recent Developments in Reinforcement," William Dirkes, WADC, Materials Laboratory, Wright-Patterson Air Force Base.

"Prediction of Load and Creep Deflection in Beams and Eccentrically Loaded Members." O. M. Sidebottom and S. Dharmarajan, Talbot Laboratory, University of Illinois.

"Room Temperature Vulcanizing Silicone Rubber; a New Versatile Engineering Material." R. Treat, Jr., General Electric Co.

Session No. 2

Chairman: Bryce Maxwell, Plastics Laboratory, Princeton University
Vice Chairman: R. J. Bourke, Plastics Division, Monsanto Chemical Co.

"Some High-Speed Tensile Properties for Thermoplastics." Richard E. Ely, U. S. Army Ordnance Missile Command, Army Rocket & Guided Missile Agency, Redstone Arsenal.

"Designing with Du Pont 'Delrin.'" Watson C. Warriner, polychemicals department, E. I. du Pont de Nemours & Co., Inc.

"Applications of Solid Polyurethane." K. H. Grim, Disogrin Industries.

"Review of Developments in Plastics Engineering, 1957-1958." R. A. Clark and R. I. Leininger, Battelle Memorial Institute.

"Polymers Are Not Products in Plastics Fabrication." J. E. Tollar, Dow Chemical Co.

Session No. 3
Chairman: E. G. Bobalek, Case Institute of Technology
Vice Chairman: John J. O'Connor, Military Medical Supply Agency, Department of the Navy

"Molecular, Microscopic, and Macroscopic Structural Data in the Design of Plastics Molding Compositions to Fit Service Specifications." Robert M. Evans, The Master Mechanics Co., and E. G. Bobalek, Case Institute of Technology.

"Significance of Physical Test Methods in Interpreting Design Properties of Plastics." Robert M. Evans, and S. M. Skinner, Case Institute.

"The Course and Kinetics of Chemical Degradation through Testing of Mechanical Properties of Plastics." J. Neil Handerson, Tito T. Serafini, and E. G. Bell, Case Institute.

"The Liaison Problem of the Translation of Laboratory Design Data into Production Practice." Robert Gelin and Robert F. Toomey, Case Institute, and William Ellslager, The Glidden Co.

"Important Design Considerations for Reinforced Plastics." Harry Nara, Case Institute.

"Summary of Papers Presented at Rubber and Plastics Sessions I, II, and III." D. H. Cornell, Knolls Atomic Power Laboratory.

Tlargi Hears Pestal

The Los Angeles Rubber Group, Inc., held a dinner-technical meeting, called American Latex Products Night, at the Biltmore Hotel, Los Angeles, Calif., on October 7. American Latex Products Corp. supplied all of the prizes as well as the dinner speaker for the program. The technical session, attended by 80 members and guests, featured Neil R. Pestal, Firestone Tire & Rubber Co., Los Angeles plant, whose subject was "High-Speed Photography in the Rubber Industry." This paper, described previously,[1] was written by G. L. Hall, J. D. Rigby, and F. S. Conant, of Firestone's Akron research laboratories. The dinner speaker, heard by 300, was Dr. Lawrence E. Vredevoe, of UCLA. He chose as his topic "The Seven Dwarfs You Meet after Dinner."

The motion picture on high-speed photography in the rubber industry was explained by Mr. Pestal. He emphasized that since most rubber products are black, and the frame and exposure time in the high-speed camera are extremely short, the problem is one of obtaining sufficient exposure. High-speed film and high light concentration on the subject are therefore essential. The amount of light necessary to expose rubber products correctly is normally sufficient to overexpose the auxiliary material in the field unless it is also dark colored.

In connection with his talk, Mr. Pestal showed a film which depicted various uses of high-speed photography in the rubber industry.

Dr. Vredevoe, at the dinner meeting, was presented by Patrick Dugan, executive vice president and general manager of American Latex, who also introduced the members of his firm who were present.

Dr. Vredevoe said that the three things man strives for are health, security, and success. Health is worth everything it costs. Security attained does not always bring satisfaction, and the attainment of success is not so interesting as the job of getting there. The speaker stressed that the lack of challenge in the schools was a real problem, and since all nature is in competition, so is the world today.

Dr. Vredevoe stressed the fact that this is the age of the "Pacific" and the age of research as done around the shores of the Pacific. The important thing today and for the future is not who you are, but what you can do. What is holding us back today—the Seven Dwarfs: Sleepy—we are not awake to the problem at hand; Dopey—we get little guidance on our way; Happy—happiness comes from within and not from without; Bashful—represents the fears we hold for the future; Sneezy—the aloof people who speak only to others supposedly in their class; so they cannot understand the problems of the ones who are not; Grumpy—those who want to maintain the status quo and claim that something new cannot be done; and Doc—one who presents statistics all the time to show why you cannot do this or that.

There are three classes of lies—lies, damn lies, and statistics. Get these out of our lives, and we can forge ahead, he stated. Do not worry about war; the peoples of the world are weary of war and realize that it is futility. The only nation that wins eventually is the one that lost the actual war.

[1]RUBBER WORLD, June, 1958, p. 428.

D. W. Maher (*left*) and S. M. Martin

Thiokol Hears Maher

Approximately 200 guests at the semi-annual meeting of Thiokol Chemical Corp.'s Technical Club heard D. W. Maher, merchandising manager, Minnesota Mining & Mfg. Co., outline the new characteristics of adhesives and the vast future growth possible in this field. The dinner-meeting was held at the company's Trenton, N. J., facilities on October 1.

Adhesives have already been successfully adapted by the aircraft industry, the speaker stated, in order to obtain the high structural strength, lightweight, smoother joints, and strong bonding necessary for supersonic aircraft. It is obvious that the building, marine, and automotive industries can adopt some of these techniques to introduce improved design, improved performance, and lower cost production.

Maher visualized as part of the coming markets in the building industry the use of adhesives in reducing construction costs. Preformed roofs, the use of translucent wall panels, improved dry wall application techniques to eliminate the time-consuming taping required, strong inexpensive sandwich panels, and many other items, he felt would make inexpensive, structurally improved residential homes a reality.

In defining adhesives, Maher outlined the wide range of adhesives now available — the 100% solid liquid form that has no volatility and is dimensionally stable—the two-part systems that are dormant until accelerated by heat, strong contact bonding types, and high structural strength laminates. One of the new developments is the new liquid-form adhesive that bonds when oxygen is excluded. This adhesive is now being used to coat threads on screws. The possibilities behind this strong fastening method seem enormous, he stated.

Development of these vast markets depends on several factors. One is the education of engineers and designers so that they can allow for the type of joints where adhesives are most effective. Another is the competition among processors in the field to market these developments successfully so that the vast number of industrial prospects are thoroughly covered.

The speaker was introduced by S. M. Martin, Jr., general manager of Thiokol's chemical division.

Boston Group Celebrates 30 Years; Symposium, Past Chairmen's Night

The fall meeting of the Boston Rubber Group the thirtieth anniversary meeting, was held October 17, at the Somerset Hotel, Boston, Mass., and featured an afternoon technical symposium on "Resin Modification of Rubber," a cocktail hour, and a banquet, which was held in honor of all 28 previous chairmen, 23 of whom were present to hear John M. Bierer, Boston Woven Hose & Rubber Co. Division, American Biltrite Rubber Co., first elected chairman, tell of the first years of the Group. A special presentation was made to each past chairman.

Resins and Rubber Symposium

The afternoon technical symposium on "Resin Modification of Rubber," attended by 175, was moderated by W. L. Seamonds, Simplex Wire & Cable Co., and was addressed by the following panel: Robert H. Haberstroh, American Steel & Wire Division, United States Steel Corp., who discussed "Resin Modification of Rubber for Wire and Cable"; James W. Ferguson, Durez Plastics Division, Hooker Electrochemical Corp., who covered "Contributions Made to Rubber Compounds by Phenolic Resins"; and Joseph Cullen, Marbon Chemical Division, Borg-Warner Corp., whose subject was "Compounding Effects of High-Styrene Resins in Various Rubbers."

Mr. Haberstroh, whose paper was coauthored with Walter G. Dahlstrom, of his company, divided his talk into two sections: insulation compounds and sheath or jacket compounds, and he discussed the effects of mineral and organic fillers on the electrical and physical properties of each. He showed with slides how inorganic fillers had deleterious effects on dielectric constant and dielectric strength, through their influence on the capacitance characteristics of insulated wires, and indicated the much lower specific inductive capacity of petroleum asphalts, coumarone-indene resins, polyethylene, high-styrene resins, and rubber itself. He then discussed the effects of these materials on processing and cured characteristics of insulation compounds and also spoke of the importance of moisture absorption in insulated wire stocks.

The speaker explained why so little carbon black is used in wire insulation and concluded his remarks on jacket compounds by describing recent developments combining the good properties of nitrile rubbers and vinyl resins in improving jacket resistance to ozone.

Mr. Ferguson, the second speaker, centered his remarks about his company's developments in phenolic resins and their uses in the rubber industry. Early attempts at utilization of these resins in natural rubber failed because of mutual incompatibility, he said, but with the advent of nitrile rubbers, modified phenolic thermosetting resins, compatible in all proportions, made great contributions to the vulcanization, reinforcement, hardness, stiffness, abrasion-resistance, heat-resistance, chemical resistance, and plasticization of this new synthetic elastomer type. The latter effect, occuring during processing only, is a rather unique effect that disappears as the resin is altered during vulcanization.

The speaker also listed the advantages of small amounts of nitrile rubber in modifying phenolic resin formulation brittleness to produce toughness and impact strength—at a price. He then described the various types of available phenolic powdered resins, base Novolaks or thermoplastic types, and Novolak-liquid resin types, where minimum stiffening is wanted. The use of hexamethylene tetramine in effecting cures with these materials was indicated, and solvent cements made with these nitrile-phenolic stocks were described.

The reduced reactivity of phenolic resins with SBR was then taken up by Mr. Ferguson, and their use as plasticizers during processing, and as stiffeners when cured, in shoe soling, toplifts, tire beads, etc., where 5-10 parts effect remarkable stiffening, was indicated. He said additional resin is deleterious, owing to incompatibility, except where nitrile rubber, as a common solvent, is added. A few applications of water-soluble resin emulsions with latices of SBR and natural rubber, as binders for glass fibers and ground cork, were given. Greater success with neoprene latices was claimed.

In conclusion, Mr. Ferguson described some of the resin-cure patents for butyl rubber and the heat-resistant effects secured with their use. For the future, he expected most developments to come with nitrile and SBR compounds, latices, and cements, and with solvent neoprene cements, where phenolics were concerned.

Mr. Cullen, the third and final speaker, described the properties and uses of high-styrene resins in improving the extrusion and electrical properties of synthetic rubbers, and their reenforcing effects in elastomeric compounds. Poor compatibility with butyl, Hypalon, polyacrylates, and Thiokol polysulfide rubbers makes them of little interest there, he said. Elsewhere they can be considered as so much hydrocarbon, slightly unsaturated and vulcanizable.

Used in hose, electrical goods, calendered goods, floor tile and chemically resistant compounds, these resins improve mixing and plasticity when they heat-soften, they improve hot-tear resistance, low-temperature embrittlement, flexing, and compression set and reduce scorching, he said. These effects of hardening and stiffening are accomplished even when fillers and pigments are replaced, and these resins are utilized to a large extent by the soling industry. Latices are available for use with synthetic resin emulsions. Some disadvantages accompany the use of these resins: They require hot mixing and produce stiff green stocks; they tend to soften at high temperatures and have high heat build-up and compression set. They, however, give fast cures and extrusion rates, good electrical properties, and reduce die-plating, he said in conclusion.

During the discussion period that followed the symposium, the application of resins in rubber and vinyl floor tile, and in hard rubber, were discussed, as were methods of reducing scorching with phenolics, cement applications and shrinkage problems with them, and special phenolics (para-substituted phenolic resins) for use with butyl, upper temperature limits for phenolics, the extent of cure possible with high-styrene resins, and methods of preventing spreading in top lifts.

Dinner Program

Following the dinner at which more than 300 were present, a quartet of Rubber Group members, called the Chem-Tones. consisting of Arthur Peros, base, B. F. Goodrich Chemical Co., director; Henry Johnson, baritone, B. F. Goodrich Footwear & Flooring Co.; Robert Ingraham, second tenor, Thiokol Chemical Corp.; and Arthur Nelson, tenor, B. F. Goodrich Footwear, entertained the members with four selections. The pianist was Richard Hoffheimer, Lincoln Labs, Massachusetts Institute of Technology.

John Williamson, Tyer Rubber Co., nominating committee chairman, submitted the following names for an executive committee member for two years, one to be elected by mail ballot and the election to be announced at the Christmas party December 12: Henry Brouseau, General Latex Corp.; George Hunt, Simplex Wire & Cable Co.; Kenneth Winkley, Hodgman Rubber Co.

Emil H. Krismann, E. I. du Pont de Nemours & Co., Inc., chairman of the Rubber Division, ACS, and former chairman (1939) of the Boston Rubber Group, spoke briefly on the Rubber Division meeting to be held in May in Los Angeles, Calif.

Bernard H. Capen, Tyer Rubber, Group chairman in 1949, was introduced as the Rubber Division director for the Boston Group.

John M. Bierer, first elected chairman of the Boston Rubber Group, spoke briefly on the early days of the Rubber Division, starting in 1919 with

Boston Rubber Group past chairmen at the anniversary meeting, October 17

the Philadelphia meeting of a few technical men, then with John Tuttle as chairman and 30 members, through the organization of the Boston Group at the Boston Chamber of Commerce in 1928, with Charles R. Boggs as acting chairman and 285 present, and then up to the present day. He pointed out that nine of the first 11 chairmen of the first 13 years were MIT men, and that of the 18 succeeding chairmen in 18 years none were from MIT.

Present at the meeting as guests of the Boston Rubber Group were 23 of the 28 past chairmen of the Group, and they filled a special table in front of the head table. Both head-table guests and past chairmen were introduced by Roger L. Steller, B. F. Goodrich Chemical Co., present chairman, who then presented each past chairman with a special tie-clasp engraved with the letters BRG and bearing a book-and-gavel emblem with the years of office of each thereon.

The next meeting will be the Christmas party, to be held December 12 at the Hotel Somerset.

Rubber Library Charge For Bibliographies

Subject	Compiled	References
1. Rubber Linings	Mar., 1952	48
2. Mastication of GR-S	Mar., 1952	91
3. The Uses of Rubber in Agriculture	Apr., 1952	34
4. Drying of Adhesive-Coated Fabrics	Apr., 1952	17
5. Tire Design and Manufacture, 1941-51	Apr., 1952	140
6. The Processing of GR-S Involving the Use of Plasticizers	May, 1952	35
7. The Use of Lignin in Rubber and Synthetic Rubbers, 1945-May 1952	May, 1952	20
8. Diaphragms. Part I. Rubber and Elastomers	May, 1952	12
Diaphragms. Part II. Metals	May, 1952	10
9. The Tensile Strengths of Natural and Synthetic Rubbers	June, 1952	22
10. The Use of Synthetic Resins in Natural and Synthetic Rubbers	June, 1952	52
11. The Determination of Ozone in Air	Aug., 1952	41
12. The Diffusion of Gases through Natural and Butyl Rubber	Oct., 1952	21
13. Mills and Calenders. Part I. Operation	Nov., 1952	8
Mills and Calenders. Part II. Safety Factors	Nov., 1952	15
14. Compounding of Gutta Percha and Balata Resins	Nov., 1952	4
15. Behavior of Gutta Percha and Balata toward Oxygen and Oxidation	Nov., 1952	4
16. The Tear Strengths of Natural and Synthetic Rubbers	Feb., 1953	56
17. Abrasion Testing of Natural and Synthetic Rubbers	June, 1954	160
18. Rubber to Metal Bonding (Excluding Brass Bonding)	Dec., 1955	135
19. Glove Dipping Techniques	May, 1955	27
20. Reclaim Rubber Cements	Dec., 1955	19
21. Permeability of Elastomers to Water and Water Vapor	Dec., 1955	50
22. The Permeability of Elastomers to Oxygen	Dec., 1955	20
23. Permeability of Elastomers to Air	Dec., 1955	10
24. Rubber Bearings	Nov., 1955	20
25. Isocyanate-Polyester Compounds	June, 1957	117
26. Continuous Vulcanization of Extrusions for Wire and Cable	July, 1956	44
27. Finishing of Small Molded Goods	Aug., 1956	16
28. Oil-Extended Rubbers	Apr., 1955	117

In a departure from past practice, the Library Committee of the Division of Rubber Chemistry of the American Chemical Society has decided to charge a nominal sum for copies of bibliographies prepared in the Rubber Division Library at the University of Akron.

Formerly, bibliographies were supplied without charge as are all other services of the Library. Demand for the bibliographies has increased to such an extent, however, that it became a distinct financial burden to the Division to continue to supply them free of charge.

Effective November 1, therefore, members of the Division will be charged \$2.50 for each bibliography, and nonmembers will be charged \$5. This policy was approved by the Division's board of directors at their last meeting in Chicago, Ill., in September.

The Library will continue its policy of making no charge for the other services it renders. A member of the Rubber Division can borrow any book or journal in the Rubber Library by asking his own local library to obtain it on an inter-library loan. The Division librarian also answers without charge any reference question on any subject related to rubber.

The list of bibliographies which are currently available is in the accompanying tabulation.

Requests for bibliographies should be addressed to Mrs. Lillian Cook, Rubber Division Library, University of Akron, Akron 4, O.

High Polymer Forum

The Ninth Canadian High Polymer Forum will be held at the Guild Inn, Toronto, Ont., Canada, on October 19-21, 1959. The Forum is sponsored by the National Research Council of Canada in cooperation with The Chemical Institute of Canada and is devoted to all aspects of polymer science. Persons wishing to contribute papers to this meeting should write the program chairman, Dr. L. A. McLeod, research and development division, Polymer Corp., Ltd., Sarnia, Ont., Canada.

Signal Corps Schedules 23 Wire and Cable Talks

Twenty-three papers on "Technical Progress in Communication Wires and Cables" have been scheduled for the seventh annual symposium of the communications department of the U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J., to be held at the Berkeley-Carteret Hotel, Asbury Park, N. J., December 2-4. Registration will begin December 1.

Titles of technical papers to be presented and their authors have been reported as follows:

December 2, morning—**"Low Loss Coaxial Cable for High-Temperature Service,"** W. A. Donohue and F. T. Smith, Thomas A. Edison Industries, McGraw Edison Co.; **"Composite Wires for Operation as Electrical Conductors at Elevated Temperatures,"** J. R. Howell, Sylvania Electric Products, Inc.; **"Development and Application Notes on 'Thin-Wall' Teflon Insulated Wire and Cable,"** J. I. Cohn, Inso Products, Ltd.; **"Evaluation of Multi-Conductor Cables Used in Ground to Air Guided Missile Systems,"** T. J. Horan and J. J. Roache, Frankford Arsenal.

December 2, afternoon—**"Flame Retardent Polyethylene for Wire and Cable,"** R. C. Graham, Rome Cable Corp., and C. A. Neros, Diamond Alkali Co.; **"Even Count Polyethylene Insulated Cable,"** F. W. Horn, Bell Telephone Laboratories; **"An Air-Layable Carrier Frequency Cable for Mobile Warfare,"** W. C. Murray, ITT Laboratories, and F. W. Wills, USASRDL, Fort Monmouth; **"Alumoweld, a New Bimetallic Wire for Electrical and Strength Applications,"** F. E. Leib, Copperweld Steel Co.; **"Crosstalk and Capacitance Unbalance Measurements, Procedures, and Significance in Multi-Conductor Cables,"** J. A. Pettit, Jr., Engineered Wire & Cable, Inc.

December 3, morning—**"Effects of Plasticizers on Dry Blending of Polyvinyl Chloride Resins,"** R. A. Park, Firestone Plastics Co.; **"Influence of Water Immersion on Electrical Characteristics of Silicone Rubber,"** M. G. Noble, General Electric Co., and W. L. Seamonds, Simplex Wire & Cable Co.; **"Enjay Butyl in Low-Voltage Applications,"** W. F. Fischer and W. C. Smith, Enjay Laboratories, G. N. Vacca, Bell Labs, and T. K. Cox, Western Electric Co.; **"Rodent Attack on Rubber and Plastics Insulated Wire and Cables,"** G. R. Bjorck, B. F. Lizell, and J. S. L. Roos, Sieverts Kabelverk, Sweden.

December 3, afternoon—**"Factors Influencing Light Transmission of Black Polyethylene,"** G. G. Cocks and A. P. Metzger, Battelle Memorial Institute; **"Microdensitometric Determination of Dispersion,"** W. G. Best and H. F. Tomfohrde, III, Bakelite Co.; **"Polythene-Mechanism of Fracture,"** P. L. Clegg, S. Turner, and P. I. Vincent, Imperial Chemical Industries, Ltd., England; **"Thermal Stress Cracking of Polyethylene—II,"** J. H. Heiss, V. L. Lanza, and W. M. Martin, Bell Labs; **"Carbon Black Loaded Cross-Linked Polyethylene for Insulated Wire and Cable,"** A. C. Bluestein, Anaconda Wire & Cable Co., and B. B. Boonstra, Godfrey L. Cabot, Inc.; **"Chemically Cross-Linked Polyethylene,"** E. R. Kerwin, General Electric Co.

December 4, morning—**"New Extrusion Techniques with Silicone Rubber,"** H. H. Bashore, E. G. Schwarz, and C. E. Simpson, Union Carbide Corp.; **"Electron Processing Techniques for Wire and Cable Irradiation,"** D. A. Trageser, High Voltage Engineering Corp.; **"The Effects of Radiation on Silicone Rubber Wire and Cable Insulation,"** C. G. Currin, Dow Corning Corp.; **"Nuclear Radiation—A New Environment for the Wire and Cable Engineer,"** R. I. Leininger and C. J. Lyons, Battelle.

The symposium committee is again headed by Howard L. Kitts, as chairman, with H. F. X. Kingsley as co-chairman, both at U. S. Army Signal Research and Development Laboratory, Fort Monmouth.

SPE Annual Technical Conference

The Society of Plastics Engineers, Inc., Stamford, Conn., is holding its fifteenth annual technical conference at the Hotel Commodore, New York, N. Y., January 27-30, 1959. Below is listed an advance program of the conference and a partial listing of the papers to be presented.

January 27, 9:00 to 11:30 A.M.
Session No. 1—Latest Developments In Stereospecific Polymers
Moderator—Herman F. Mark,
Polytechnic Institute of Brooklyn

"Propylene and Copolymers of Propylene and Ethylene—Synthesis & Structure," Frank C. McGrew, E. I. du Pont de Nemours & Co., Inc.

"Polyolefin Production with Preformed Solid Catalysts," A. A. Harban, E. Field, and H. N. Friedlander, Standard Oil Co. (Ind.)

"Polybutadienes of Controlled *Cis*, *trans*, and Vinyl Structures," J. N. Short, C. Kraus, R. P. Zelinski, and F. E. Naylor, Phillips Petroleum Co.

"Stereospecific Title Unknown," G. Natta, Polytechnic Institute of Milan.

January 27, 2:00 to 4:30 P.M.
Session No. 2—Topics of Special Interest
Moderator—Robert B. Mesrobian,
Continental Can Co.

"Effect of Gamma Radiation on Plastics," R. R. Stromberg and B. G. Achhammer, National Bureau of Standards.

"Non-Destructive Testing," Johan Bjorksten, Bjorksten Research Laboratories, Inc.

"Chain Rupture by Shear in Molten Polymer," H. A. Pohl and J. K. Lund, Princeton University.

"Instruments as Tools of Automation," Richard A. Wade, Brown Instrument Division, Minneapolis-Honeywell Regulator Co.

January 27, 2:00 to 4:30 P.M.
Session No. 3—Thermoforming
Moderator—Robert Bostwick,
Bakelite Co.

January 27, 2:00 to 4:30 P.M.
Session No. 4—Extrusion—Part 1
Moderator—Robert Sackett,
Monsanto Chemical Co.

January 27, 2:00 to 4:30 P.M.
Session No. 5—Injection Molding—Part I
Moderator—Saul Blitz,
Tico Plastics, Inc.

January 27, 8:00 to 9:30 P.M.
Session No. 6—Educational Symposium
Moderator—R. C. Bartlett, Chairman,
SPE National Education Committee

January 28, 9:00 to 11:30 A.M.
Session No. 7—Plastics in High-Temperature Electrical Insulation
Moderator—Sidney J. Stein,
International Resistance Co.

January 28, 9:00 to 11:30 A.M.
Session No. 8—Aesthetic Aspects of Plastics
Moderator—Gordon K. Storin,
Speer Carbon Co.

January 28, 9:00 to 11:30 A.M.
Session No. 9—Vinyls
Moderator—Frank Greenspan,
Food Machinery & Chemical Corp.

"Vinyl Resins," F. R. Bukey, Firestone Plastics Co.

"Vinyl Stabilizers," Charles H. Fuchsman, Ferro Chemical Corp.

"Vinyl Plasticizers," J. J. Morris, Union Carbide Chemicals Corp.

"Plastisol, a Labor-Saving Device," Hugh B. Allison, Chem-o-sol Sales.

January 28, 9:00 to 11:30 A.M.
Session No. 10—Mold Design—Part I
Moderator—Ernest J. Csaszar
Newark Tool & Die Co.

January 28, 2:00 to 4:30 P.M.
Session No. 11—Reinforced Plastics

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Moderator—R. W. Ehlers,
Lowell Technological Institute

January 28, 2:00 to 4:30 P.M.
Session No. 12—Blow Molding
Moderator—Elmer E. Mills,
Highland Park, Ill.

January 28, 2:00 to 4:30 P.M.
Session No. 13—Extrusion—Part II
Moderator, James F. Carley,
Modern Plastics

January 28, 2:00 to 4:30 P.M.
Session No. 14—Injection Molding —Part II
Moderator—Gerard C. Heldrich,
W. R. Grace & Co.

January 29, 9:00 to 11:30 A.M.
Session No. 15—Printed Circuits
Moderator—Edward B. Murphy,
Lincoln Laboratories, Massachusetts Institute of Technology

January 29, 9:00 to 11:30 A.M.
Session No. 16—Plastics in Buildings
Moderator—Wm. Goggin,
Dow Chemical Co.

January 29, 9:00 to 11:30 A.M.
Session No. 17—Test Methods
Moderator—Frank W. Reinhart,
National Bureau of Standards

January 29, 9:00 to 11:30 A.M.
Session No. 18—Mold Design—Part II
Moderator—John A. Kavanagh,
Standard Tool Co.

January 29, 2:00 to 4:30 P.M.
Session No. 19—Ultra-High-Temperature Reinforced Plastics
Moderator—Wm. R. Lucas,
Army Ballistics Missiles Agency

January 29, 2:00 to 4:30 P.M.
Session No. 20—Cellular Plastics—Foams
Moderator—Alan J. Breslau,
Thiokol Chemical Corp.

January 29, 2:00 to 4:30 P.M.
Session No. 21—Epoxy Resins
Moderator—Jerome Bassin,
The Borden Co.

January 29, 2:00 to 5:00 P.M.
Session No. 22—Plastic Packaging: Workshop
Moderators—E. A. Haddad and
R. R. Moyer, Monsanto

January 30, 9:00 to 11:30 A.M.
Session No. 23—New Materials
Moderator—Robert Sherman,
Bakelite

"New Developments in AVS Polymers," Howard H. Irvin, Marbon Chemical Division, Borg-Warner Corp.

"Elkinite Resins—Reverse Polyesters," Irving E. Muskat, Elkin Chemical Co.

"A New High-Temperature Thermoplastic Resin," W. E. Manring, B. F. Goodrich Chemical Co.

"Progress in New Materials Research," Irving Skeist, Skeist & Schwarz Laboratories, Inc.

January 30, 9:00 to 11:30 A.M.
Session No. 24—Adhesives
Moderator—Jerome Been,
Rubber & Asbestos Corp.

January 30, 9:00 to 11:30 A.M.
Session No. 25—Permanence Properties
Moderator—Turner Alfrey,
Dow Chemical

January 30, 9:00 to 11:30 A.M.
Session No. 26—Compression Molding
Moderator—Edward Vail, Bakelite

Radiation and Rubber at NYRG Fall Meeting

Some 200 members and guests attended the New York Rubber Group's fall meeting at the Henry Hudson Hotel, New York, N. Y., on October 17. The technical session, a symposium on radiation and rubber, consisted of three papers; while the after-dinner entertainment was an interesting talk, "Grotesques of the Mind," presented by H. Walter Grote. Also at the meeting, the officers for the coming year were elected.

Atomic Concepts

The first of the technical papers was "Review of Atomic Concepts," by D. S. Ballantine, Brookhaven National Laboratories. Dr. Ballantine stated that radiation effects studies on organic materials involve the interaction of charged particles (alphas, protons, beta rays, and electrons), electro-magnetic quanta (gamma and X-rays), or uncharged neutrons. The charged particles react by interaction of the electric field of the alpha or other charged species with the bound electrons in a molecule. This interaction produces excitation of the electrons or in some cases ionization. The excitation can lead to bond breaking and thus chemical changes. Simultaneously, the charged particle is slowed down and absorbed.

Gamma radiations interact by a photoelectric process in which a photon-electron interaction results in emission of an electron and disappearance of the photon. Alternately and more importantly, the photon can give part of its energy to the electron which is emitted and be scattered, a process known as Compton scattering.

The neutron, Dr. Ballantine continued, depending on its energy can undergo two main processes, scattering or absorption. In a scattering reaction the neutron collides with a nucleus to which it imparts energy and is scattered at reduced energy. In each collision the neutron loses energy until after sufficient collisions it is in thermal equilibrium with its environment. The other reaction is absorption in which the neutron is captured by a nucleus with the formation of a new nucleus which may be radioactive.

Gamma ray and electron radiations do not produce radioactivity in the materials irradiated (except under unusual circumstances); while neutron bombardment can produce appreciable radioactivity if the material irradiated has an isotope which readily absorbs neutrons.

Radiation Vulcanization

The second paper, "Radiation Vulcanization of Elastomers," was presented by Dale J. Harmon, B. F. Goodrich Research Center. The studies which have been made in the field of radiation effects on rubber and plastics can be broken into four main groups: radiation-induced polymerization, cross-linking of plastic materials, graft polymerization, and vulcanization of elastomers. The study of radiation-induced polymerizations has gained new momentum with the discovery of what appears to be the ionic polymerization of isobutylene at —80° C. by exposure to gamma rays. Graft polymerizations have received much attention since they present a unique method for altering the surface of a film or fiber to change the hydrophilic or adhesion characteristics. Recently ion exchange membranes prepared by a radiation-induced graft technique have become available commercially. Many examples of cross-linking of plastics to alter physical properties are known. Perhaps the most common is that of radiation cross-linked polyethylene sold commercially as Irrathene and Hyrad.

In general, it may be said that with the exception of good high-temperature properties, radiation vulcanizates offer nothing new in the way of physical properties. The advantages appear to be that vulcanization can be accomplished without the use of those vulcanizing agents which may represent a real portion of the total materials cost of conventional curing; cold vulcanization of extruded goods can be realized; uniform cures can be obtained in thick items difficult to cure uniformly by conventional means; and elastomers which are difficult or impossible to cure by chemical means may possibly be given useful cures by irradiation.

Without the discovery of a method of lowering the amount of radiation required for vulcanization, it appears that radiation vulcanization will probably not be competitive cost-wise within the next ten years. It should be kept in mind, however, that besides the savings possible from the elimination

of many compounding ingredients, appreciable savings may be introduced owing to the elimination of such items as curing pits, molds, and curing ovens. The engineer will also be free to revise his production line in order to capitalize on the high-speed continuous-flow advantages of radiation cures.

One of the most important considerations to be kept in mind is that development of industrial applications for radiation is of prime interest to our nuclear power program. Radioactive by-products will become available in larger and larger quantities as this program progresses. Disposal of these by-products will present a large problem. If large-scale industrial uses for these materials can be developed, this procedure will aid in relieving the waste disposal problem to some extent and will also assist in reducing the cost of operation of nuclear power plants.

Radiation Damage

The third paper, "Radiation Damage to Elastomers," was presented by W. R. Griffin, Wright Air Development Center. He stated that nuclear power is an attractive source of power, but to make use of this energy, secondary systems are needed which often contain rubber parts. High energy radiation is a severe environment for elastomers causing an upset in the amount of cross-linking in the polymer network.

Oxidation is a major portion of the observed radiation damage and can be greatly reduced by substances known as antirads. More than antioxidants, antirads possess other damage inhibiting qualities that make them a valuable means of protecting today's elastomers. A blanket of nitrogen gas also has antirad qualities. Analysis of gases liberated during the irradiation of elastomers reveals that highly branched polymers are less stable than the linear types.

Compression set combines the effects of cross-linking, chain scission, and loss of branch chains to become the most sensitive property to damage by radiation. Design and selection of materials as well as exclusion of oxygen will extend the useful life of elastomers in this severe environment; the real solution is the development of radiation resistant polymers.

New Officers

Also at the meeting officers of the group for the coming year were elected as follows: chairman, R. B. Carroll, R. B. Carroll, Inc.; vice chairman, Irvin S. Kern, R. T. Vanderbilt Co.; secretary-treasurer, R. G. Seaman, RUBBER WORLD; and sergeant-at-arms, E. T. Heckman, Raw Materials Co. Executive committee members, three-year term, are: W. J. O'Brien, Seamless Rubber Co.; E. C. Strube, Crescent Insulated Wire & Cable Co., Inc.; A. H. Woodward, Du Pont; and Bryant Ross, Frank B. Ross Co., Inc.

Fort Wayne Meeting

The first meeting of the 1958-59 season of the Fort Wayne Rubber & Plastics Group was held in the Van Orman Hotel, Fort Wayne, Ind., on September 25. There were 149 present, who enjoyed a delicious dinner.

The new officers for this season are Philip Magner, Jr., chairman, The General Tire & Rubber Co.; W. D. Wilson, vice chairman, R. T. Vanderbilt Co.; Allen Bluestein, secretary-treasurer, Anaconda Wire & Cable Co.; publicity chairman, Charles Collins, The Celotex Corp.; membership chairman, Ed I. Bosworth, Columbian Carbon Co.; ticket chairman, Ed Rosenberg, E. I. du Pont de Nemours & Co., Inc.; menu chairman, Earl Gottschalk, Paranite Wire & Cable Co.; program chairman, Mr. Wilson; and chairman golf outing, Ed Theall, Dryden Rubber Division, Sheller Mfg. Corp. The directors are Mr. Theall; George Kelsheimer and R. Knapp, both of United States Rubber Co.; J. Lawless, du Pont; R. Hartman, Monsanto Chemical Co.; N. Klemp, Dryden Rubber; R. Mack, Western Rubber Corp.; J. Porter, H. Muehlstein & Co., Inc.; and S. Shaw, Witco Chemical Co.

Victor H. Vodra, technical director, Rubbermaid, Inc., Wooster, O., gave a very interesting illustrated talk on "Designing Colored Rubber Compounds." A film was also shown through the courtesy of Interchemical Co.

In discussing the design of colored rubber compounds, Mr. Vodra covered elastomers, resins, activators, white pigments, fillers and reinforcing agents, softeners, antioxidants, accelerators and vulcanizing agents, color availability, the effects of sunlight and ultra-violet light on colors, color migration, etc., as factors in building practical colored rubber compounds.

More complete details of Mr. Vodra's talk appear in RUBBER WORLD, November, 1957, page 260.

The next meeting of the Group will be held December 4 at the Van Orman.

Bingham Medal Award

Ronald S. Rivlin, chairman of the division of applied mathematics at Brown University, Providence, R. I., will be awarded the Bingham Medal of the Society of Rheology at its annual meeting November 5-7 at The Franklin Institute, Philadelphia, Pa. He is being honored for his research in the fields of mechanics of highly deformable solids, dynamics of high-polymer solutions and electrical circuit theory and physics.

The Bingham Medal was established in honor of Professor Eugene Cook Bingham who from the Society's founding in 1929, until his death in 1945 played a primary role in the development of rheology as a science. Rheology, the study of deformation and flow of matter, is a specialized branch of mechanics.

Dr. Rivlin was born in London, England, in 1915. A graduate of the University of Cambridge, he received his master's degree there in 1939 and the Doctor of Science degree in 1952. Before joining Brown University in 1953, the Medalist did research at the California Institute of Technology and the Davy Faraday Laboratory of the Royal Institution in England.

Other organizations for which he has worked include the General Electric Laboratories, the Telecommunications Research Establishment, the British Rubber Producers' Association, all in England, and the National Bureau of Standards and the Naval Research Laboratory in Washington, D. C.

A Fellow of the British Institute of Physics and the American Academy of Arts and Sciences, Dr. Rivlin is also a member of the Institute of the Rubber Industry, England, and an associate member of the British Institution of Electrical Engineers.

BFG Extralite Soling

B. F. Goodrich Industrial Products Co., Akron, O., has announced the development of the first lightweight shoe soling that is said to outwear any other soling. Called Extralite, the new soling may also set new styling trends in footwear because it can be made in every color.

The soling is made of a unique combination of high-grade synthetic rubbers that gives it above-average resistance to abrasion, scuffing, and cracking, and exceptional flexibility and makes it completely waterproof, the company reports.

The new soling is said to be easier to work with than other materials now being used for shoe bottoms. Its bonding strength assures strong cement bonds for cemented shoes; while the smooth, almost glass-like, cut edge eliminates edge finishing problems encountered in cellular types of firm soling.

The wide range of colors in which Extralite soling can be produced should provide manufacturers with new and interesting color combinations for men's, women's, and children's shoes. The light weight of the soling is also in keeping with the trend toward featherweight footwear in adult and children's fashions.

The material, which is non-marking like all BFG shoe products, is available to manufacturers in both molded and slab form in any thickness. It will be competitive in price with other premium soling.

In addition to this new material for shoe products, BFG makes Extrasoft heels, Extrawear heels, and Extratough soles and taps.

WASHINGTON REPORT

By JOHN F. KING

Senate Report on Science Coordination Cites Progress on Central Data Agency

The Senate Government Operations Committee plans launching a comprehensive survey of federal science activities when the 86th Congress convenes early in 1959. The study would serve as a follow-up to the preliminary investigation of the national government's role in the field of science and technology carried out by the Committee staff earlier this year and subsequent public hearings held in the summer by the Humphrey Subcommittee on Federal Reorganization.[1]

Science Secretary?

The focus of the forthcoming study will be, as it was in the staff and Subcommittee investigations, the prospects for setting up a Cabinet-level Department of Science and Technology to coordinate federal science activities into an intelligent and cohesive program.

Regardless of whether a cabinet agency is needed to carry out this objective, supporters of measures to revitalize the government's science-promoting efforts believe some legislative action is urgently needed to mesh the scattered activities of more than 30 components of executive departments and independent agencies which currently are engaged in science activities.

Central Tech. Information Service

The Reorganization Subcommittee, headed by Sen. Hubert H. Humphrey (Dem., Minn.), held hearings on some aspects of the proposed Science and Technology Act of 1958 (S-3126) in May and June, but Congress adjourned without taking any action on the bill. The Humphrey Subcommittee dealt primarily with ways and means of streamlining federal services in the accumulation and dissemination of technological data of use to all the sciences. The emphasis of the Humphrey study was on the possibility of revamping the jerry-built system of collating, translating, abstracting, indexing, storing, and retrieving technical papers now scattered around the government.

While no legislation resulted, the staff of the parent full Committee on Government Operations under Director Walter L. Reynolds has kept after the subject, riding herd on federal bureaus working in the science field in an attempt to effect administrative steps toward a degree of centralization. Under the name of Senator Humphrey, the staff has issued a progress report on the Committee's success in its efforts. The report also summarizes legislative steps in this direction taken by the 85th Congress before it adjourned in September.

The report indicated the Committee took its greatest satisfaction from the action of the National Science Foundation in "taking steps to assume national leadership in the scientific and technical information services carried on both within and outside of Government." NSF Director Alan T. Waterman had informed the Committee that his agency currently is "recruiting a staff and developing a program to meet the need for an organization that, on a nationwide basis, will be able to identify and analyze" the whole question of technological data coordination.

NSF, Dr. Waterman assured the Committee, will see to what can be done to improve federal activities in: (1) storage and retrieval of mechanical translation developments and studies; (2) support of primary publications; (3) improvement of secondary publications; (4) collection of unpublished research information; (5) support of scientific data and reference centers; and (6) collection and analysis of foreign science information. In addition, Dr. Waterman said NSF will set up an advisory committee representing the interests of industry, science, and government to "keep our plans and programs continually and realistically responsive to the information needs of the scientific community."

Another administrative breakthrough the Committee appeared to relish was agreement from the Commerce Department to step up its efforts in solving the "data lag."

[1] RUBBER WORLD, May, 1958, p. 286.

Working with NSF and the Library of Congress, the Commerce Department's Office of Technical Services will establish a foreign technical information center to provide abstracts and translations of Soviet technical documents and articles for the use of American science and industry.

The progress report noted that the Reorganization Subcommittee's summer hearings also developed information that such bodies as the National Academy of Sciences and the National Research Council were "actively engaged" in creating their own program for cooperation in the documentation field. NAS expects to establish an Advisory Board on Information and Documentation in Science, with members of "high competence," including both scientists and information specialists, to prepare a plan for "effective action" on the program.

NASA Agency

In a quick survey of legislation measures by the 85th Congress which tended to carry out the objective of closer coordination of federal science activities, the report cited the creation of the National Astronautics and Space Administration and the Military Reorganization Acts. In the case of NASA, it said that while space and astronautics is a rather narrow field just now, and that creation of the space agency is "not in conformity" with plans for an overall Science and Technology Department, the new agency "may be considered as a necessary first step toward this ultimate objective."

New Defense Department Set-Up

More directly serving the interests of a coordinated science program, however, was the Military Reorganization Act, the report said. Particularly gratifying in this legislation was the creation of the Office of Director of Research and Engineering within the Defense Department, which will supervise research and development expenditures estimated to total more than $2.7 billion in fiscal 1959. If "test and evaluation" programs of the military are added to the R & E totals, overall spending by the Pentagon in the current fiscal year in science and related fields will run substantially over $6 billion.

The new Director of R & E will be

the principal adviser to the Secretary of Defense on scientific and technical matters, authorized to "engage in or contract for (as contrasted to purely coordination and funding responsibilities in the past) basic and applied research pertaining to weapons systems and other military requirements." The new post is endowed with two highly significant attributes—rank above the Assistant Secretaries of Defense, and compensation equal to that of the Secretaries of the Army, Navy, and Air Force.

Agriculture and Small Business

A third legislative measure the Committee sees as a forward step in the drive to create a more efficient technical data system was an amendment of the Agricultural Surplus Disposal Law to permit funds accruing under the disposal program to be used for data collection in foreign countries and the support of international scientific cooperation.

Under the surplus disposal program, government-owned farm products, acquired under the agricultural price support program, are sold abroad for foreign currencies. An estimated $4 billion worth has been disposed of this way in the last four years. The amendment of the act referred to in the progress report merely authorizes the use of such currency accounts for the collection, collation, translation, abstraction, and distribution of scientific and technical documents available abroad, for use here. The National Science Foundation is expected to be the principal disseminating agency for general science papers acquired abroad.

Another Congressional measure the Committee staff assesses as important to science was an amendment to the Small Business Act to aid small business firms obtain government contracts for research and development. The amendment gives these firms access to "the benefits of research and development already performed at Government expense, and will allow a number of small firms to pool their resources to carry out a scientific project with the aid of a loan from the Small Business Administration."

Rubber Definitions in New Tariff Schedules Major Industry Concern

The United States Tariff Commission is crossing the *t's* and dotting the *i's* of its final report to Congress on the government's latest attempt to modernize the 30-year-old schedule of U. S. tariff definitions. Still unsettled, however, are two issues directly affecting the rubber industry that may cause controversy.

The broader of the two questions appears to be, just what is rubber and/or synthetic rubber? The other poser is whether the definition of rubber footwear threatens to open up that long-standing controversy over rubber footwear imports.

What Is Rubber?

The Commission already has held public hearings on the revamped chemical schedule, which includes a proposed definition for "Rubber" under Schedule 4—Chemicals and Related Products. USTC is still awaiting the comments of the industry's experts, however, who are currently being polled as to their views. The Commission's proposed definition is as follows:

"The term rubber," in this subpart, means a substance in bale, crumb, powder, latex, or other crude form, whether or not containing fillers, extenders, pigments, or rubber-processing chemicals, which can be vulcanized or similarly processed into materials which can be stretched at 68° F. to at least twice their original length and which, after having been so stretched and the stress removed, return with force to approximately their original length."

While standing by for comments on its proposed definition of rubber, the commission did take one concrete action: it refused to incorporate in the new Schedule 4 the so-called "Brussels Nomenclature" definition of synthetic rubber, as proposed by Polymer Corp., Ltd., of Canada.

The Brussels Nomenclature for Classification of Goods in Customs Tariffs, chapter 40, is entitled "Rubber, synthetic rubbers, factice and articles thereof," and includes 16 headings, of which heading 40.02 relates to synthetic rubbers. The definition given here for synthetic rubbers, which was rejected by the USTC reads as follows:

"Apart from thioplastes (which are specifically excluded) the expression 'synthetic rubber' applies and applies only to unsaturated synthetic substances, which can be irreversibly transformed into non-thermoplastic substances by vulcanization with sulfur, selenium, or tellerium and which, when so vulcanized as well as may be (without the addition of any substances such as plasticizers, fillers, or reinforcing agents not necessary for the cross-linking), can produce non-thermoplastic substances which at a temperature of 15 to 20 degrees Centigrade will not break on being extended to three times their original length and will return after being extended to twice their original length within a period of two hours to a length not greater than one and one-half times the original length."

The "Brussels Nomenclature" definition, according to Commission experts, is that appended to the General Agreement on Tariffs and Trade (GATT) and is being proposed as an international definition for synthetic rubber. While USTC is having difficulty in deciding on proper definition for "rubbers" as compared to "plastics" for tariff purposes, it decided not to accept the international GATT definition.

The USTC has left it up to the technical societies such as the American Society for Testing Materials and the American Chemical Society and industry technologists in these organizations to develop a proper definition of rubber. It is understood that a group of experts has been meeting on the subject and will inform the Commission of their findings within the next few weeks for incorporation in the January report to Congress.

Rubber Footwear Problem

Definitions are an issue in connection with rubber footwear and the USTC also. Industry experts, when they saw USTC's technical description on "man-made fibers" in the new Textile Schedule, promptly expressed concern. They said this definition might be employed by importers conversant with the ins and outs of tariff technicalities to open up new loopholes in the long-established "American Selling Price" principle[1] of duties on imported footwear.

Man-made fibers, as defined in the Commission's Subpart E of Schedule 3, entitled "Textile fibers and Textile Products," states:

"The term 'man-made fibers,' as used in these schedules, means filaments or fibrous structures made by man from cellulosic material or other material by processes such as polymerization, condensation and chemical transformation, but does not include glass or other ceramic filaments or fibers, nor metal, paper or natural rubber filaments or fibers."

Since this definition covers man-made fibers wherever that term appears in the proposed revised schedules, it could remove from the rubber shoe category any rubber footwear manufactured in whole or in chief part from, say, glass or paper.

Recalling the recent history of importer maneuvering to avoid the stiff duties based on U. S. rubber footwear prices, some industry experts foresaw new battles ahead in the customs courts and in Congress, to keep the American Selling Price principle intact. A group of technical experts from the Rubber Manufacturers Association is conferring with the Commission staff on the problem, and it is believed some change might be made in the definition before the report goes to Congress.

It will be remembered that twice within the past four years domestic footwear producers have had to peti-

[1]RUBBER WORLD, June 1958, p. 441

tion Congress for laws closing loopholes in the 1930 Tariff Act and the 1933 Presidential proclamation requiring rubber footwear imports to be levied at 20% of the U. S. retail price.

In 1954, Public Law 479 closed one loophole whereby a piece of leather was inserted into the sole of imported rubber footwear. Again this year, the Sadlak bill closed a subsequent loophole, left open by P. L. 479, whereby pieces of leather were superimposed on the uppers of imported rubber shoes. In both instances, the addition of leather was to qualify the imports in question, for customs purposes, as being in chief part leather. As such, they were able to enter the American market at about half the American selling price for rubber footwear.

Minimum Wage Hearings Make Faltering Start

Public hearings to determine the "prevailing" wage rate or rates within the rubber industry got off to a faltering start in October. Three days of testimony—on the 8th, 9th, and 10th of the month—were devoted largely to government experts. Management has barely started its presentation; and labor, in the person of United Rubber Workers Union witnesses, had not been heard from at all when the hearings were recessed until later in the month.

When resumed on the 21st, the proceedings, ordered in September by Labor Secretary James P. Mitchell, are expected to touch more directly on the points at issue: What is the "prevailing wage" in the industry, and should it be applied on a nation-wide basis, or should the differences in wage rates within the industry caused by geographical location be reflected in separate, regional "prevailing" rates?

The prevailing wage procedure is required by the Walsh-Healey Act. This statute authorizes the Secretary of Labor to set minimum wage standards for an industry. Should a manufacturer fail to live up to the rate prevailing in his industry—in the case of rubber, it could be anywhere from $1 to $3 per hour—he risks losing his government contracting business. Walsh-Healey provides that employers with government orders for $10,000 or more must comply with prevailing wage rates set by the Labor Department or lose further contracts.

The rubber companies oppose this type of wage regulation on the argument that incentive-pay systems widespread in the industry do not lend themselves to an enforced minimum-wage policy. They maintain, moreover, that the scores of rubber products often manufactured by a single company within the industry will present problems as to which employes of the firm in question are working under government contract and which are not.

The provisions of the law, however, leave the Labor Department little leeway in considering whether or not there should be a minimum wage. The Walsh-Healey Act still is a basic element in federal labor policy and must be complied with. Labor Department officials indicate they will be guided in the determination of a prevailing rate with a due regard for the rubber industry's well-entrenched incentive-pay system.

University Launches Educational Program On Patents, Copyrights, and Trade Marks

George Washington University, St. Louis, Mo., has discovered that the American public is completely ignorant of what the United States patent system is, how it functions, and what its problems are. The school's Patent, Trade Mark & Copyright Foundation has decided to do something about it.

Educational Campaign Planned

The Foundation announced in mid-October it is inaugurating a nation-wide educational program with the purpose of bringing a greater knowledge of the patent and related systems to the country. The campaign will be directed primarily at the nation's youth.

High school and college students, the Foundation said, are being chosen as "informal targets" because they learn easily, are receptive to new information, are in a position to benefit in their choice of careers, and are more frequently brought into contact with the patent system through technological and scientific curricula—even though they may not be aware of it.

While the educational program has its emphasis on youth, officials of the Foundation believe that as it has a special timeliness because of the international climate, every citizen should understand at least the fundamentals of the patent system and its importance to national science policy.

Mosel Study

The Foundation decided to embark on the campaign after reading the results of a research study, completed for the Foundation by James N. Mosel, associate professor of psychology at George Washington. Dr. Mosel's survey "revealed an almost complete ignorance on the part of the American public" as to what the patent system is. The Foundation found this the more deplorable because the pace of the Age of Science in recent years had been widely thought to have increased public awareness of the system and its workings.

Nation-Wide Project

Now undertaking a comprehensive study of patents, trade marks, and copyrights in connection with the campaign, the Foundation is enlisting the services of its area committees in Boston, Chicago, Cleveland, Detroit, Milwaukee, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis and Washington for the initial part of the program.

These committees, made up of men with scientific, legal, or administrative training in the professional and business world, have been asked to assemble information kits and manuals for high school and college students suitable for the geographic area in which each committee is located. Committee members also have been asked to confer with school authorities on the most effective use of these publications and to enlist support for the program in their respective areas.

URW Head Says Product Price Hikes Too Great

The United Rubber Workers Union (AFL-CIO) is protesting the manufacturers' claim that the recently negotiated 8¢-per hour wage increase won by URW triggered the 2½ to 3% price hike on rubber products.

The companies introduced the price adjustment shortly after the completion of wage negotiations with the union in late summer.

Union President L. S. Buckmaster in an October statement claimed the companies "simply cannot justify this reasoning—it is plainly not so." He charged the price boost "is plainly designed to boost already substantial profits," which he estimated for the Big Four this year will total $130 million, after taxes. By contrast, he continued, the 8¢ wage increase granted by the Big Four will cost them only about $6 million.

The URW General President complained that while the industry is placing "the entire blame" for the price hike on labor, it omits to consider in the readjustment that rubber material costs in key sectors have dropped. He mentioned specifically the slideoff in natural rubber and nylon cord prices.

Buckmaster conceded, indirectly, that a small price increase might have been warranted following the industry's settlement with URW. The wage boost, which he maintained was just 3% of the pre-existing pay rates in the industry, could have been "completely recovered" by a price increase of less than 1%.

"By raising prices 2½ to 3%," he said, "the companies are continuing their profit-pressure on the general price level."

INDUSTRY NEWS

Trainer Cites Forces Working For And Against Automation in Industry

Strong forces are working both for and against automation in American industry, James E. Trainer, executive vice president, Firestone Tire & Rubber Co., told the second national Symposium on Instrumentation in the Rubber and Plastics Industries, sponsored by the Instrument Society of America, in Akron, O., in late October. The forces pushing industry toward automation are stronger than those opposing it, he added.

The first of the major forces working against rapid and widespread automation is the capital investments that must be made. The money to automate must be accumulated, and until a business does accumulate sufficient capital investment funds that business is not going to be automated because the price is simply too high, the Firestone executive said.

The lack of personnel trained to manufacture, install, control, and maintain the devices of automation was listed as the second force working against automation.

Mr. Trainer felt that the present boundaries of technological knowledge are the most important reason why automation will be relatively long in coming. The apparent widespread belief outside the professions responsible for automation that everything has been accomplished is ridiculous in view of the facts, he declared.

One of the most compelling forces pushing industry toward automation is the life-or-death necessity for this country to stay out in front in the international race for technological and scientific supremacy. Two parallel courses which must be followed if the United States is to cope with the Soviet menace were suggested. The first is toward sheer scientific supremacy and technological know-how so that, in the military sense, no one will dare attack us because of their fear of our retaliatory power, he explained.

The second course involves the necessity of maintaining American economic stability in the face of the efforts of enemies of the free world to bleed us white economically. This would be accomplished, he stated, (1) by making us spend enormous sums on defense which they hope will be inferior to their own, and (2) by outproducing us in quantity and costs so that, in time, they may capture the markets of the world.

Other factors compelling American industry toward automation are a projection based on the known improvements made in our living standard, and a projection of the increase on population; the third is a calculation, to a great extent, based on the findings of the first two. This calculation, it was pointed out, is made in terms of the output of goods and services that will be required at various times in the future.

In 1975, for example, with an estimated population of 220 million, the output of goods and services would have to be doubled in order to maintain an average improvement in the standard of living. By 1975, however the working force of the country will have increased only 35%.

Other pressures for widespread automation were listed as (1) the necessity to reduce costs to expand markets, (2) the ever-present challenge to improve product quality, (3) to meet and, where possible, to surpass competition, and (4) the constantly expanding horizons of scientific knowledge.

Opponents of automation, according to Mr. Trainer, fear that the movement will result in a wide displacement of labor, but he said he was not worried. The automobile industry, despite automation, still had an increase of more than 100% of workers between 1941 and 1955. In the general field of manufacturing, employment rose 73%, while population of the country went up only 22%. Between 1940 and 1950 there was an increase of 159,000 telephone operators despite the installation of dial phones.

In explaining the effect of automation on industry as a whole, Mr. Trainer said he expected that with increasing automation there will be a reduction in costs and an increased supply of goods of uniform, high-quality.

New Union Carbide Plastics Co.

Union Carbide Corp., New York, N. Y., has established a new name for its plastics division, effective November 15. Bakelite Co. becomes Union Carbide Plastics Co. This change is another step in the program initiated last year by Union Carbide to cement corporate identity with its broad range of products. The plastics company, according to R. K. Turner, president, will continue to produce and sell a full line of products under the familiar Bakelite and other well-known trade marks.

J. D. Benedito, vice president—sales, announced a sales organization keyed to customer service for the newly named plastics division. He also reported the appointment of J. L. Rodgers as director of sales, and T. W. Sharp as director of product marketing. Rodgers will be in charge of product selling operations, and Sharp will be responsible for planning and specialized marketing functions.

Benedito stated that the new sales organization was the result of an intensive study. Customers were interviewed as to their technical service requirements and asked for their frank appraisal of the strengths and the weaknesses of the organization. To speed up local decisions and gain benefit from on-the-spot local knowledge, six regional managers have been appointed.

In addition, planning and specialized marketing functions such as new product and process development, market development, advertising, and promotion have been separated from the selling and technical service activities. Benefits from this change are (1) increased local concentration and immediate action on customer problems and (2) integrated, specialized marketing functions for faster product introduction and availability.

Grace's New Research Center

The largest industrial chemical research center in Maryland, and the state's one-hundredth industrial research facility, was unveiled on October 21, by the 104-year-old W. R. Grace & Co. Located near Clarksville, Md., the $5-million Washington Research Center of the Grace Chemical Group brings together 250 scientists and technicians. Constructed on a 150-acre site, the two main buildings are the beginning of a research and development center that will eventually be four times its present size.

The new research center has more than 96,000 square feet of floor space; two-thirds of this area is devoted to modern laboratories and experimental

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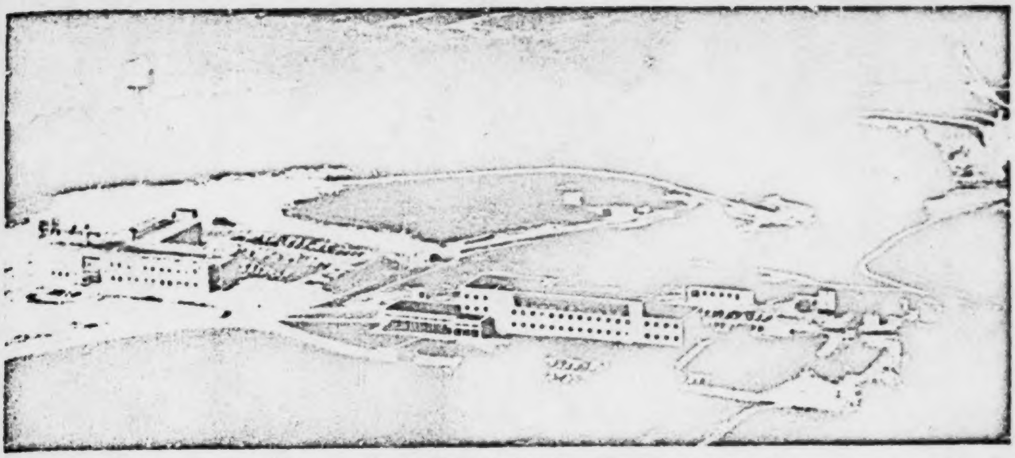


Aerial view of W. R. Grace's Washington Research Center

equipment. According to W. P. Gage, president of Grace Research & Development Division, the center will augment the many research projects that the Grace Chemical Group has under way in its own facilities throughout the world, as well as contracts with private laboratories and research grants to numerous activities. The Chemical Group is composed of: Davison Chemical Divison, Dewy & Almy Chemical Division, Dewey & Almy Overseas Division, Cryovac Division, Grace Chemical Division, Polymer Chemicals Division, and the Grace Research & Development Division.

The new center is equipped with the latest scientific instruments. Among the important units is the Van de Graaff electron beam generator. This instrument is in the radiation laboratory which has been built into the side of a hill that serves as a natural barrier for protection from high energy radiation.

The first building of the center, completed early this year, is four stories in height and has 52,000 square feet of floor space. In addition to 36 offices and 32 laboratories, it houses a library, conference room, and a cafeteria.

The second building, completed last month, is of two-story construction. It has 42,000 square feet of floor space. The 32 laboratories in this building are the most modern and practical in industry, based on extensive surveys made by scientists.

Both buildings are faced in brick with limestone copings and a granite base. Heating, air conditioning, and ventilating systems feature direct fresh air intake with no recycling of used air. The center has its own water system and sewerage purification system.

Some of the various departments of the center include petroleum catalyst laboratories, gasoline evaluation units, agricultural research laboratory, inorganic chemistry department, research services department, new product development section, organic chemistry department, and polymer chemistry department. Emphasis in polymer research has been on polyethylene, polypropylene, and other polymers in the polyolefin family.

A 16-page two-color illustrated brochure describing the activities of the new Washington Research Center is available from the company on request.

CALENDAR of COMING EVENTS

November 17-21
Eighth National Plastics Exposition. Society of the Plastics Industry. International Amphitheatre, Chicago, Ill.
National Plastics Conference. Hotel Morrison, Chicago.

November 21
Philadelphia Rubber Group. Dance. Manufacturer's Golf & Country Club, Oreland, Pa.

November 30-December 5
American Society of Mechanical Engineers. Annual Meeting. New York, N. Y.

December 2-4
Seventh Annual Wire & Cable Symposium. U. S. Army Signal Research & Development Laboratory, and Industry. Berkeley-Carteret Hotel, Asbury Park, N. J.

December 4
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

December 5
Detroit Rubber & Plastics Group, Inc. Christmas Party. Statler-Hilton Hotel, Detroit, Mich.

December 6
Northern California Rubber Group. Christmas Party. Orinda Country Club.

December 8-9
Rubber & Plastic Adhesive & Sealant Mfrs. Council. Shoreham Hotel, Washington, D. C.

December 9
Buffalo Rubber Group. Christmas Party. Buffalo Trap & Field Club.

December 12
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.

Boston Rubber Group. Christmas Party. Hotel Somerset, Boston, Mass.

December 13
Southern Ohio Rubber Group.

December 19
Chicago Rubber Group.

January 23
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

January 26-29
Plant Maintenance & Engineering Show. Public Auditorium, Cleveland, O.

January 30-31
Southern Rubber Group. Statler Hotel, Dallas, Tex.

February 2
Washington Rubber Group. Army-Navy Club, Washington, D. C.

February 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

February 6-8
Boston Rubber Group. Annual Ski Week-End. White Mountains, N. H.

R. A. Emmett   C. O. Davidson   M. H. Leonard   J. W. Snyder

Columbian Carbon Staff Changes

C. O. Davidson has been appointed general sales manager of the carbon black and pigment division, Columbian Carbon Co., New York, N. Y., and J. W. Snyder has been made carbon black technical director. Davidson, formerly domestic sales manager, is now in charge of the sale of all the division's products here and in Canada.

M. H. Leonard, formerly manager of technical service, Midwest area, becomes sales manager, rubber chemicals, headquartering in Akron, O. His former duties will be handled by W. E. Ford. R. H. Marston will continue as district sales manager in charge of the area served by the Akron office. J. A. Gotshall continues as Akron resident manager.

The carbon black technical department has been expanded to include new product evaluation under Snyder. R. A. Emmett has been named assistant technical director. L. J. Venuto is now associate technical director working on technical service and new product evaluation of industrial blacks and dispersions.

H. A. Braendle, now associate technical director, will handle development and technical service of the new Columbian black rubber process, a process which has created wide interest in the synthetic rubber industry. L. D. Treleaven has been appointed manager, rubber technical service, eastern area.

Commodity Exchange's Silver Anniversary

Commodity Exchange, Inc., New York, N. Y., celebrated its twenty-fifth anniversary year with a gala reception and dinner for members and guests on October 9, in the Hotel Astor, New York. Commodity Exchange, Inc., was formed in 1933 when the New York Hide Exchange, the National Metal Exchange, the Rubber Exchange of New York, and the National Raw Silk Exchange were merged into one institution for futures trading in crude rubber, silk, hides, silver, copper, and tin.

The feature speaker for the Exchange's silver anniversary dinner was Leo Cherne, executive director, Research Institute of America, Inc., who told those present that "it is in the trade of the world's most vital commodities that we see the most creative and essential expression of dynamic capitalism. In this exchange of the most vital commodities, the world can genuinely hope for a broader and more peaceful future.

"The American economy," he continued, "is in the foothills of the Fabulous '60's. The sheer dimensions of the growth that will take place stagger the imagination and will stretch even America's fantastic capacity to produce.

"Total population in the United States," said Mr. Cherne, "will go up 27 million during the 1960's. This increase of 15% in the nation's population will carry an explosion even more significant. In the same ten years, the population of those between 20 and 29 years old will increase by almost 40%. Since this is the age group that does the marrying, the home building, buying and furnishing, and is responsible for most of the family growth, the economic consequences are profound indeed."

Mr. Cherne forecast a gross national product that would be close to $500 billion by the end of 1959 and nearly $600 billion by 1970, with an increase in consumer disposable income exceeding $450 billion by 1970.

Harold A. Rousselot, Commodity Exchange president, in his introductory remarks briefly reviewed the achievements of the past 25 years and formally welcomed the guests of honor. During the introduction of the honor guests, Mr. Rousselot paused to present a special gift to Comex legal counsel, Julius Baer, senior partner, Baer, Marks, Friedman, Berliner & Klein. The gift, an antique French mahogany game table, carried an engraved plaque saluting Mr. Baer as one of the prime founders of the Exchange.

Quality Control For MC&TSA Inspectors

Quality control, including visual examination, testing, and maintenance of inspection records in the manufacture of items for use by the Army, Navy, Air Force, and Marine Corps, will become the responsibility of contractors according to new policy and procedures governing acceptance of supplies.

The government's role in procurement inspection will then be to verify the reliability of the contractor's testing and quality control data. To be better prepared for this new role, Military Clothing & Textile Supply Agency inspectors will receive specialized training in statistical quality control, it was announced by Major General Webster Anderson, USA, executive director.

Anderson viewed this specialized training as one of the most important steps taken by MC&TSA to assure the availability of only the best qualified personnel for the performance of MC&TSA inspection activities, and to advise the contractors regarding their quality control systems.

Two booklets recently issued by the Agency discuss in detail the responsibility of industry and the government under the new concept of procurement inspection. Called "This Is Contractor Testing" and "This Is Contractor Examination," they are available from Inspection Division, 2800 S. 20th St., Philadelphia 45, Pa.

Copolymer Dedicates New Research Center

The Copolymer Rubber & Chemical Corp., Baton Rouge, La., dedicated its new research building on September 25 at Baton Rouge. It is the center of basic research activities conducted by the corporation.

The structure is of modern architecture and was designed by Kuehne, Brooks & Barr, Austin, Tex. It is 180 by 60 feet, and the front of the building is a unique sun screen made up of a series of the Copolymer trade mark, a hexagonal figure. The building contains chemical, polymerization, and instrument laboratories; coffee shop, work shop, and storeroom facilities; a library and conference room for the general use of all plant personnel; and appropriate office space for supervisory personnel. The building is completely air-conditioned with separate air-conditioning controls for each laboratory. The present research staff numbers 15; the building, however, is designed to house a staff of 30 people.

Paul G. Carpenter, vice president of research and development, stated that in the past Copolymer has emphasized development activities and has conducted these activities on a very high level. In order to achieve the same high standards for research, it was necessary that the corporation broaden its program with increased emphasis on basic research.

In a statement made at the dedication ceremonies, A. K. Walton, president of Copolymer and vice president in charge of manufacturing for Sears Roebuck & Co., said that the new research center represents an investment in the future of the company and the community. The years ahead hold every promise of continuing growth and accomplishment, and the key to this progress lies greatly in research and development, he declared.

Carpenter stated that an active, efficient research and development group assures Copolymer of continuing at high level the inquisitive pioneering spirit which has resulted in numerous firsts, such as the well-known cold rubber, cold high solids latex, and Carbomix black masterbatch. It means a diligent search for new products, a systematic and thorough effort to improve quality of present products and realistic evaluation of the current rubber industry.

Copolymer, formed in 1955, is jointly owned by seven companies: The Dayton Rubber Co., Dayton, O.; Gates Rubber Co., Denver, Colo.; Mansfield Tire & Rubber Co., Mansfield, O.; The Armstrong Rubber Mfg. Co., West Haven, Conn.; Seiberling Rubber Co., Akron, O.; The Armstrong Rubber Co., West Haven, Conn.; and Sears Roebuck & Co., Chicago, Ill.

New Tropiglas Panels

Reinforced plastic panels, based on a new plastic material and designed specifically for outdoor architectural applications, will soon be marketed nationally by Naugatuck Chemical division, United States Rubber Co., Naugatuck, Conn. The plastic used is a pure acrylic syrup developed by E. I. du Pont de Nemours & Co., Inc., which has been reinforced with glass fibers and laminated into flat panels in a press.

The laminating technique, the result of four years of research, was developed by Russell Reinforced Plastics Corp., Lindenhurst, N. Y. Naugatuck Chemical markets all architectural products made by Russell Reinforced.

Called Tropiglas, the panels will be made in sheet sizes up to 3.5 by 8.5 feet, and in thicknesses ranging from 0.060- to 0.100-inch. They will be translucent and available in unpigmented form or in 22 Cathedral colors —standard colors for all reinforced plastic panels marketed by Naugatuck.

Applications for which the panels are intended include sun-deck and patio roofing, partitions, church windows, and other glazing uses such as skylighting.

The new panels have been extensively tested outdoors in Florida and several other parts of the country. Over a year of exposure in these areas, during all types of weather, had no noticeable effect on the color or surface of the panel. Laboratory tests, which simulated outdoor weathering, showed the same good results.

While ability to resist aging and the color-fading effects of sunlight and weather are the outstanding advantages of the new panels, they are also said to be extremely durable and have a smooth, glossy surface that is attractive and decorative.

Distribution of the new panels will be made through more than a score of architectural material distributors throughout the country. Actual marketing is expected to begin before the year's end.

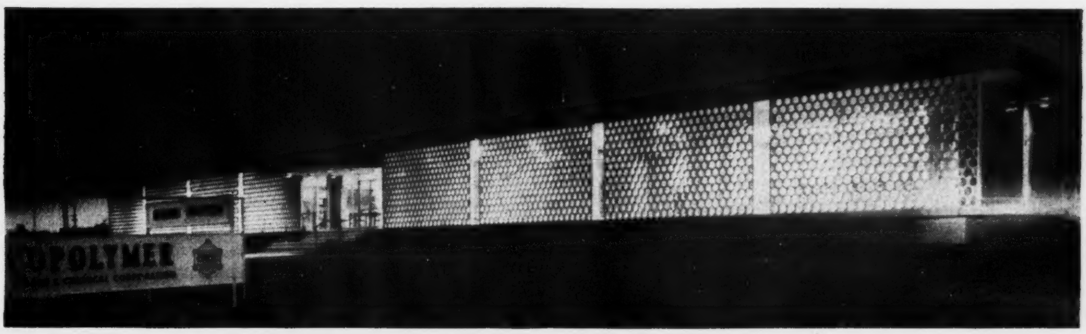
Scrap Rubber Panel

A panel discussion on current rubber problems facing the waste material industry was one of the feature topics at the general membership meeting of the Scrap Rubber & Plastics Institute on October 10, in conjunction with the National Association of Waste Material Dealers' national fall meeting in Atlantic City, N. J. Sidney Freedman, H. Muehlstein & Co., Inc., New York, N. Y., president of the Institute, stated that the meeting paralleled the general theme of the NAWMD October 9-12 gathering of "Resurgence: for Progress and Accomplishment."

Freedman was chairman of the meeting, and the panel members were Ben Gordon, A. Schulman Inc., Akron, O., and Henry Freed, H. Muehlstein & Co., Inc., New York, N. Y.

In conjunction with the Institute meeting, a general brainstorming session was also conducted on the future activities, projects, and scope of the NAWMD Scrap Rubber & Plastics Institute.

Announced at the meeting, held at The Shelburne, Atlantic City, was the forthcoming retirement of Miss Janet Weiner, treasurer of NAWMD. She will retire on January 1, 1959, after 35 years of service to NAWMD. In authorizing her retirement, the board of directors at the same time named M. J. Mighdoll, who is NAWMD administrator, to assume also the post of treasurer.



Copolymer Rubber & Chemical Corp.'s new research center at Baton Rouge

Business, Wages, Laws On RMA Annual Program

Appraisals of the 1959 outlook on the business, legislative and collective bargaining fronts by experts in these fields will feature the forty-third annual meeting of The Rubber Manufacturers Association, Inc., to be held at the Park Lane Hotel, New York, N. Y., November 20.

The meeting will begin at 10 a.m., following a brief annual meeting of the RMA's membership at 9:15 a.m. A reception at 12 noon will be followed by luncheon at 1:00 p.m. The name of the luncheon speaker has not yet been announced.

Jules Backman, professor of economics at New York University's School of Commerce, Accounts & Finance, and advisor to the steel industry and American railroads for many years in national wage cases, will discuss the 1959 outlook for business and collective bargaining. Dr. Backman has done extensive research and writing in the field of collective bargaining and has conducted research for such groups as the Brookings Institution, the National Industrial Conference Board, the President's Cost of Living Committee, the National Retail Dry Goods Association, the Surety Association of America, and many others.

The three other speakers on the morning program will be Karl Nygaard, director of business research for The B. F. Goodrich Co.; Ross R. Ormsby, RMA president; and W. James Sears, RMA vice president.

Mr. Nygaard, speaking in behalf of the RMA statistical committee, will cover the rubber supply-demand outlook and will discuss the economics of the rubber manufacturing industry in a chart presentation. Mr. Ormsby will review the Association's work and discuss general objectives that the various divisions and committees have set up for the year ahead. Against the backdrop of the general elections and changes in the political complexion of the new Congress, Mr. Sears will discuss the legislative outlook.

Walker Joins RW As Technical Editor

Richard S. Walker joined the staff of RUBBER WORLD in October as technical editor. He replaces Merritt M. Goff, who resigned to return to teaching at North Carolina State College.

Mr. Walker is exceptionally well equipped by education and experience for the position of technical editor. He received his B.S. in chemical engineering from Lehigh University in 1950, after a leave of absence for naval service from 1943 until 1946, when he saw active service as signalman 1/c in European, African, and Pacific areas.

Richard S. Walker

He joined the H. O. Canfield Co., Bridgeport, Conn., in 1951 and remained there until 1955, advancing to the position of assistant to the technical director. His duties included compounding and processing problems, quality control, laboratory supervision, and technical service work.

In 1955 he became chief chemist of Virginia Rubber Corp., Clifton Forge, Va., an H. O. Canfield subsidiary, reporting to the vice president and resident manager in connection with all phases of plant operation in this mechanical rubber goods plant. His duties here involved technical services, purchasing, scheduling, and responsibility for the milling and extruding departments, including foremen and employe training.

Mr. Walker was most recently, since 1957, a nitrile rubber sales engineer for the chemical division, Goodyear Tire & Rubber Co., Akron, O. In addition to his responsibility for technical service on nitrile rubber, he assisted senior sales engineers for SBR and rubber chemicals, operating primarily as liaison between the field sales force and laboratory and production personnel.

He is a member of the American Chemical Society and its Division of Rubber Chemistry and of the American Society for Testing Materials, as well as of several service clubs and community welfare activities.

RW's new technical editor was born in North Brookfield, Mass., October 26, 1924. He is married and has five children.

Superior Shoe Soling From Paracril OZO

United States Rubber Co., New York, N. Y., reports that it has developed a shoe soling material from its new, modified oil-resistant synthetic rubber, Paracril OZO, which promises to be outstanding in wearing properties particularly in the oil-resistant work shoe field.

Soles for work shoes that are subjected to oil and abrasive service are being made from the new material by the Gro-Cord Rubber Co. Lima, O., and will be marketed by Montgomery Ward Co. through retail outlets and direct mail. In field tests these new soles have been worn for better than 20 weeks under industrial conditions that wore out ordinary oil-resistant shoe soles in three to four weeks.

This new material is also being tested for military shoes which can be discarded when completely worn out without need of sole repairs and for children's shoes which will last until the shoe is outgrown. The material is molded in place or molded and then stitched or cemented in place.

Paracril nitrile synthetic rubber produced by the rubber company's Naugatuck Chemical Division is blended by a special technique with Marvinol vinyl resin, also made by Naugatuck, to give Paracril OZO. The vinyl resin adds ozone resistance and increases the nitrile rubber's already high resistance to oil and abrasion. Abrasion resistance three times as great and oil resistance twice as high as currently produced oil-resistant soles are claimed for the Paracril OZO soles.

Paracril OZO can be brightly colored and is being investigated for use in cable jackets, hose, tubing, gaskets, flexible moldings, and boat fittings as well as in sole applications.

Farrel-Birmingham Buys Extruder Company

Farrel-Birmingham Co., Inc., Ansonia, Conn., has purchased the Electrophysical Engineering Co., division of National Automotive Fibres, Inc., Orange, Calif., maker of small plastics extruders.

During the past few years the extruders company introduced in the California area its line of EPE plastics extrusion machines, which range in screw diameters from two to six inches and which feature Inductomatic heating of the stock. The inventor of the Inductomatic element, R. E. Wenzel, will join Farrel-Birmingham extruder division with headquarters in Ansonia.

Under the new ownership, sales and service of EPE equipment on the West Coast will continue under Leonard Rose. Manufacturing will be carried on in the present plant at Orange, Calif., also in the F-B Rochester, N. Y., plant.

Farrel-Birmingham, manufacturer of several lines of heavy machinery and machine tools, is a leading supplier of heavy-duty equipment to the rubber and plastics industries. Among its products are extruders for both rubber and plastics with screw diameters ranging up to 24 inches.

E. J. Thomas

Goodyear Advances Five

Directors of the Goodyear Tire & Rubber Co., Akron, O., at a recent meeting elected E. J. Thomas chairman of the board of directors, succeeding P. W. Litchfield, who becomes honorary chairman. Thomas continues as the company's chief executive officer.

Russell DeYoung, executive vice president, succeeds Thomas, becoming the company's ninth president. P. E. H. Leroy, executive vice president, has been elected vice chairman and continues as the company's chief financial officer.

Vice President Sam DuPree moves up from coordinator of the company's general managers to vice president of production. Richard A. Jay, assistant to the president, replaces DuPree as vice president. DuPree was also named to the company's policy committee, which includes Thomas, Leroy, and DeYoung and Executive Vice President Victor Holt, Jr., in charge of sales, and Vice President and General Counsel Howard L. Hyde.

Board Chairman Thomas joined Goodyear in 1916, was appointed director of personnel in 1926, named superintendent of the California plant in 1928, and returned to Akron in 1930 as assistant to the factory manager. Two years later he was promoted to general superintendent. Assigned to England in 1935 as managing director of the company's operation there, a year later he returned to Akron as assistant to the president. Named executive vice president and elected to the board of directors in 1937, three years later Thomas was elected president and in 1956 was named chief executive officer and president.

Honorary Chairman Litchfield, with the company since 1900, was its factory manager in 1911; four years later he was elected a vice president and president in 1926. Named chairman of the board and president in 1930, ten years later he relinquished the post of president to Thomas. In his 60 years with the company Litchfield has been an important contributor to the rubber industry's progress, as well as in fields of aviation, aeronautics, and transportation.

DeYoung has been with Goodyear since 1928, having served in supervision in the Akron and Java plants until 1935. During the years 1936 to 1939 he was in Akron with the Tech Service division. Then, named assistant to the president of Goodyear Aircraft Corp., he was appointed vice president in charge of production and a member of the board of directors at Aircraft in 1942. Appointed vice president of production and elected to the board of directors at Goodyear Tire in 1947, he was made executive vice president in 1956.

Tire Check in Wichita

The largest and most significant tire safety check ever undertaken in the United States was conducted September 15-26 in Wichita, Kan. Sponsored by the Inter-Industry Highway Safety Committee and conducted by members of the Wichita Tire Dealers Association, the sweeping study revealed startling information.

Almost 24 million automobiles are rolling over U. S. streets and highways on unsafe tires if findings in the study of the condition of tires on Wichita's 120,000 registered passenger vehicles are projected to the nation as a whole.

Speaking on behalf of the Inter-Industry Highway Safety Committee, Frank P. Lowrey, Washington, D. C., co-ordinator of the Wichita Plan, said that for the first time in the history of vehicular safety research we are able to document the fact that unsafe tires are a critical factor in highway safety.

High-school student check teams, under the direction of experienced tire men, checked more than 36,000 vehicles in every community and industrial parking lot in Wichita. They found that four out of every ten automobiles had tire trouble of some sort.

The most shocking fact, Lowrey said, was that inspectors found 6,500 vehicles on which tire damage was dangerous in the extreme. One or more tires on these cars had been so badly cut or bruised or had been so badly flex-cracked that it would have been unsafe to drive them even at minimum city speed limits.

In summarizing this pilot study, Lowrey said that the survey indicated two things: (1) too many motorists are trying to squeeze unsafe mileage out of their worn tires, and (2) too many drivers fail to realize the need of frequently checking tire conditions for signs of misalined wheels.

Russell DeYoung

Air Guard Tire Sealant

United States Rubber Co., New York, N. Y., has introduced a rubber powder product that makes any tubeless passenger-tire puncture sealing. Installation of the powder in the tire is simple and can be performed by any service station at a nominal charge. At present, puncture sealing is available only as a built-in feature of some higher-price premium tires.

Tubeless tires containing 2½ ounces of the powder, called Air Guard, can be driven for 48 hours or more after being punctured, even if the puncturing object has not been retained by the tire, according to the company.

When a tire containing the compound has been punctured, the powder quickly plugs the hole. The motorist may then continue to drive safely for 48 hours or hundreds of miles. This gives him ample time to reach a service station where he can have the tire permanently repaired, thus eliminating roadside tire changing.

The powder does not affect the repairability of the tire and does not change the balance or performance of the tire in any way, it is reported. It retains its sealing efficiency for the life of the tire or until it is removed. After a punctured tire has been repaired an additional 2½ ounces of the powder should be put into the tire. It works only in tubeless tires.

In extensive field tests the powdery compound sealed punctures in the tread of tubeless tires up to ⅛-inch in diameter. According to studies of tire punctures made in various sections of the country, the diameter of the average puncture is less than 1/10-inch. Forty-two per cent of the nation's drivers had at least one puncture last year.

U. S. Rubber indicates that Air Guard will be sold and installed by its tire dealers at a nominal charge. A patent has been applied for.

Keener New Goodrich Chief Executive

John Lyon Collyer, chairman of the board of directors of The B. F. Goodrich Co., Akron, O., announced on his sixty-fifth birthday, September 18, that he will relinquish the position of chief executive officer of the company in which he has served for 19 years, first as president and then as chairman of the board.

Collyer said that the board of directors has elected J. Ward Keener, president, to fill the position of chief executive officer of the company and that he himself would, at the request of the board, continue to serve as its chairman.

During Collyer's period as head of the rubber company it experienced notable growth and recorded many milestones significant to the rubber and chemical industries and to the country as well. From 1940 to 1957 inclusive, sales increased 405%, net income 543%, and net income per share of stock 746%. The common stock was split six for one.

Under Collyer's leadership, Goodrich was a major factor in initiating the country's large-scale synthetic rubber program which assumed life-saving proportions during World War II. This pioneering began with the introduction of Goodrich Ameripol tires made with synthetic rubber in June, 1940, 18 months before Pearl Harbor. He campaigned vigorously for a large-scale government production program and saw this goal accomplished earlier in the war period as a result of the steps taken and the know-how acquired in the course of his company's program.

After the war, BFG likewise pioneered the tubeless tire for automoblies now in virtual standard use. The company also carried through a diversification program including the establishment of The B. F. Goodrich Chemical Co.

Collyer also has served the government as advisor to the State Department in international meetings on rubber supply and, at the request of President Roosevelt, served as director of Rubber Programs in 1945. In 1947, Collyer was a member of the committee appointed by President Truman to make recommendations on the Marshall Plan.

Keener, succeeding to the post of chief executive officer, has been an important participant in the company's growth. He joined BFG in 1937 as a research analyst, later becoming director of business research, assistant to the financial vice president, and assistant to the president.

In 1946, at the age of 37, he was elected vice president of employe relations and became vice president with corporate staff responsibilities in 1950. In 1956, Keener was elected executive vice president with operating responsibilities for several of the company's divisions. He was elected president effective August 1, 1957.

J. Ward Keener

John L. Collyer

Kennecott To Buy Okonite Co.

Kennecott Copper Corp., New York, N. Y., and The Okonite Co., Passaic, N. J., recently announced plans to affiliate. Charles R. Cox, president of Kennecott, and R. Stuart Keefer, president of Okonite, said that a contract has been signed by which Kennecott would acquire through a new subsidiary company the properties, assets, business, and good will of Okonite in exchange for shares of Kennecott common stock on a share-for-share basis.

The proposal is to be submitted to Okonite stockholders at a special meeting November 24 and, if approved, would take effect immediately.

The arrangement will bring together a major producer of copper and one of the most technically advanced of the independent cable makers. Founded 80 years ago, Okonite is best known for its premium-grade insulated wires and cables furnished for power transmission and distribution, control and signal systems, and electronic and communication circuits. Its main customers are power and light companies, railroads, and large industrial plants. A sizable number of specialty cables is produced for the military service, especially for use in the missile, naval shipboard, and Signal Corps programs. Annual sales have averaged $45 million for the past five years.

Okonite operates manufacturing plants in Passaic, Paterson, and North Brunswick, N. J., and maintains a nation-wide warehousing, sales, and distribution network. The company employs about 2,200 persons.

Kennecott plans to continue the fundamental Okonite policies and to accomplish this arrangement the employment contracts of Okonite's principal officers will be taken over to assure the continuance of their services. The present Okonite operating management includes: A. F. Metz, chairman of the board; Mr. Keefer; C. M. Kirkland, vice president—marketing; D. W. Nurse, vice president—manufacturing; and R. P. Lapsley, vice president—research. While the present Okonite company will be dissolved, a new company with the same name will be formed and operate as a subsidiary of Kennecott.

Okonite shares are listed on the American Exchange. The company has approximately 1,000 stockholders.

Goodrich Tires for X-15 Dual Nose Wheels

Two tires on the dual nose wheels of North American Aviation's rocket powered X-15 will absorb the impact of landing the first manned space vehicle after its pioneering probe of the upper atmosphere. The X-15, research airplane being produced as a joint project of the U. S. Air Force, U. S. Navy, and the National Advisory Committee for Aeronautics, will aim for altitudes of more than 100 miles above the earth at speeds exceeding 3,600 miles an hour.

The tires, made by B. F. Goodrich Aviation Products, Akron, O., will not be pressed for take-off performance as the X-15 will be launched from a B-52 mother ship. But on its return to earth at Edwards AFB, the X-15 will land at a subsonic speed that will demand top tire performance. Two skids will comprise the main landing gear.

The Goodrich tires being supplied for the X-15's pioneering flight are size 18x4.4 with eight-ply rating. They are identified as fabric laminated tread with a Sinewave tread design. According to BFG, the new fabric tread tire for aircraft has proved in test that it can outperform and outwear any other jet airplane tire.

NEWS BRIEFS

Esso Research & Engineering Co.'s president, Eger V. Murphree, recently stated that solid rocket fuels will probably replace liquid types for purely military purposes such as long-range missiles. Missile systems using solid propellents—generally resembling synthetic rubber—have a basic military advantage because they can be launched almost instantaneously. The handling, storage, and launching preparation for liquid systems is more complex and slower in general, he remarked. For outer space travel, however, it is anticipated that liquid propellents will play a very important, if not dominant role. He noted before the second national Energy Resources Conference in Denver, Colo., that petroleum derived fuels—in both liquid and solid forms—are the chief propellents available today and are expected to be vital in the future as well.

International B. F. Goodrich Co., a division of The B. F. Goodrich Co., Akron, O., has announced the first major manufacturing industry in Iran, a tire and tube plant to be erected in Tehran. Organization of B. F. Goodrich Iran, Inc., in which the American company will be associated with a group of Iranian investors, was also announced. Construction of the plant will start November 15, and completion is scheduled for July, 1960. Goodrich is now associated with 20 companies in the rubber products and chemical industries located throughout the world.

Crossfield Products Corp., Roselle Park, N. J., has announced a high-performance neoprene-based adhesive for ceramic tile after a period of development and performance which began in 1945. This material, designed for use in areas where other adhesives fail, is said to have a bond strength at least eight times that of conventional adhesives. Known as Dex-O-Tex BC-100, it has been developed to meet requirements for difficult or marginal conditions. It is supplied in the form of cans of neoprene paste and bags of dehydrating powders. These materials are mixed and applied with a toothed trowel. Applications include shipboard swimming pool tiles, bonding ceramic tile to prefabricated curtain walls, or bonding to almost any clean surface.

Continental Carbon Co., New York, N. Y., plans expansion of its Ponca City carbon black plant. The announcement was made by Robert I. Wishnick, president of Continental Carbon, and Harold G. Osborn, a director of Continental Carbon and senior vice president of Continental Oil Co., in a joint statement. The plans call for an increase from 50 million to 75 million pounds of oil furnace blacks annually. Construction is to start shortly and is expected to be completed by Fall, 1959. Production from this plant and from Continental plants at Eunice, N. M.; Sunray, Tex.; and Lake Charles, La., is distributed by Witco Chemical Co., Inc.

Goodall Rubber Co. has opened a new office at 1270 Avenue of the Americas, Rockefeller Center, New York 20, N. Y. At this office will be J. E. MacDonald, Jr., vice president, director of national accounts, and Edward L. Marshall, Northeast regional manager. The district sales office and warehouse will continue at the Goodall Building, 5-7 White St., New York 13, N. Y.

The Garlock Packing Co., Palmyra, N. Y., is manufacturing vital packings, seals, and gaskets utilizing Viton, the versatile new broad-temperature-range polymer developed by E. I. du Pont de Nemours & Co., Inc., which has proved so successful in military aircraft and missile applications. The developed formultions, ranging in durometer hardness from 60 to 90, will be used in manufacturing O-rings, Chevron packings, Klozure oil-seal elements, Mechanipak mechanical seal bellows, sheets, molded and extruded shapes for application in which maximum resistance to deterioration by heat, oils, solvents, and many corrosive liquids is essential. The designations for these formulations are: Styles 9663 at 60 durometer; 9466 at 70 durometer; 7592 at 80 durometer; 9659 at 90 durometer; and 7623 at 80 durometer. Style 7621 is an off-white Viton Formula for use in the food industry. All other styles are black. Garlock Viton Style 9671 O-rings for use in military aircraft have unusual resistance to hot air and hydraulic fluids, it is claimed. Additional information may be obtained from the company.

United States Rubber Co., New York, N. Y., will reopen its plant at Milan, Tenn., on December 1 to make tread rubber for the South's fast-growing tire retreading industry. The plant was closed in July when the canvas-soled shoes formerly made there were moved to the Mishawaka, Ind., plant. The Milan plant will produce camelback at the rate of 8,000,000 pounds a year initially, with future production schedules geared to meet the needs of the tire retreaders in the south, south central, and southwestern areas. This plant output will supplement the production of the company's other plants at Indianapolis, Ind., Los Angeles, Calif., Eau Claire, Wis., and Chicopee Falls, Mass. It will employ 20 persons, with A. T. Vaughn, former chief engineer at the plant, as plant superintendent.

Cia. Italiana Nest-Pack S.P.A., Bologna, Italy, manufacturer of the Panta-Pak plastic packaging material, has been granted design patent No. 183,318 from the United States Patent Office. Licensee of the Italian company in the United States is The Pantasote Co., Passaic, N. J., which is manufacturing, distributing, and selling Panta-Pak on a nationwide basis. Panta-Pak, which comes in various sizes and shapes, is, as far as price is concerned, competitive with paper board and is not only very popular among fruit growers, but also in very high demand by the confectionary and baking industries and for other articles which need cushioning and protection from various adverse elements.

Armstrong Rubber Mfg. Co., Des Moines, Iowa, is adding a new $1.5 million warehouse to its facilities. Designed by Armstrong engineers, the three-floor, brick and concrete structure will provide 260,000 square feet of floor space and feature inside loading facilities for 12 semi-trailer truck units and three railway freight cars.

The B. F. Goodrich Co. has begun construction of an ultra-modern, $250,000 warehouse and office building in Houston, Tex. The 49,000-square-foot building will house zone and district offices and will serve as a warehouse for the company's complete line of tires. B. F. Goodrich Industrial Products Co. will also use the warehouse. The facility, which will employ 25-30 people according to present plans, will be located on a four-acre tract in the southeastern portion of Houston. The single-story, cream-colored tile building will be surrounded by two acres of paved area for parking and trucking operations. It is planned to permit efficient, one-directional flow of materials. In-coming trucks and railroad cars will be unloaded on one side of the building; while outgoing trucks are being loaded on the other side.

The General Tire & Rubber Co., Akron, O., has announced that it has legally stopped a California company from imitating the tread pattern of its Dual 90 tire. In an action in the Los Angeles Federal District Court, which resulted in a consent decree, the Los Angeles Matrix Co., Bell, Calif., and one of its jobbers have been permanently enjoined from producing or selling retreaded tires that have a tread design and pattern confusingly similar in visual appearance to General's Dual 90, from making or selling any retread matrix for this purpose, and from contributing in any way to this purpose. The action is still pending against two retreaders who have been retreading tires with these matrices.

The B. F. Goodrich Co.'s Harmon G. Shively, in a paper recently presented at the thirteenth annual instrumentation-automation conference sponsored by the Instrument Society of America at Philadelphia, Pa., stated that a ready market is assured for the firm which can produce equipment for such operations as temperature measurement in high-frequency heating applications, non-destructive testing, chemical analysis, ply separation detection, and complex cross-section extrusion measurement.

Beebe Rubber Co., Nashua, N. H., has announced that two new additions—gray and natural—have been made to the Ripple sole line. Now for the first time these two colors will be available in a full run of sizes for men, women, and children. Until now Ripple soles were available for volume use in red, brown, black, and white only. The new gray and natural Ripple soles will be exhibited by Beebe Rubber at the National Shoe Fair, Booth 38, Palmer House, Chicago, Ill.

Petroleum Chemicals, Inc., New Orleans, La., has brought on stream at Lake Charles, La., a petrochemical plant designed to produce 200,000,000 pounds annually of ethylene. The ethylene will be sold to other chemical manufacturers for use in making polyethylene plastics, ethylene oxide, and ethylene glycol anti-freeze. As part of the operation, the plant will also make propylene, a petrochemical useful in making synthetic detergents and plastics. Bruce K. Brown, president of P.C.I., said that the plant is part of a multi-million dollar expansion program launched at Lake Charles two years ago.

Ripple Sole Corp. has moved into new and more spacious quarters at 510-511 Mutual Bldg., Detroit, Mich., in order to make adequate provision for the firm's continuously increasing scope of operations. The move, made September 20, was announced by Leonard Hack, president.

The Goodyear Tire & Rubber Co., Akron, O., has manufactured two rolls of belting, more than 12 feet high and weighing 13 tons each, which are part of an order for a mechanization program by Ash Grove Lime & Portland Cement Co., Louisville, Neb. Shipped by rail car, the mile of conveyor belting must be transported by a special route because of the height of the rolls. The 36-inch wide belts will be spliced together for a half-mile haul of limestone from quarry to mill at 1,000 tons an hour. The belting is constructed of special rubber compounds with four plies of 48 H. D. N. F., a heavy-duty, cotton-nylon fabric developed by Goodyear.

Firestone Tire & Rubber Co. of California dedicated a new laboratory for research, engineering, and design of guided missiles and weapons systems on September 27, at Monterey, Calif. The new laboratory, located on a 20-acre site, is a single-story, concrete block and steel structure which consolidates the work of the company's staff. Firestone is prime contractor for manufacture of the Army's Corporal guided missile. The company also designed and manufactures the launching systems for the Regulus I and II guided missiles and is engaged in work on the Polaris and Matador missile systems. George R. Thurman directs the new laboratory's activities.

Cities Service, whose three divisions operate more than 19,000 service stations in 38 states, has moved to simplify and strengthen its tire business by switching to nylon cord exclusively in passenger tires, according to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Passenger tires are said to account for approximately 90% of total Cities Service tire sales. Cities Service reports that by offering only nylon cord tires it is able to simplify inventories and to economize on warehousing expense. The newest Cities Service price list includes 53 sizes and types of nylon cord tires, and to duplicate all these tires in rayon cord would be both costly and confusing.

Stillman Rubber Co., Culver City, Calif., has developed a new system of bonding Hycar nitrile rubber to metal parts, resulting in optically smooth precision rubber parts ground to dimensional tolerances. As a result of the new system, called Permadizing, rubber-to-metal parts are free of flash, precise in dimension, and have optically flat surfaces for effective sealing at almost zero pressure, it is claimed. The new bonding process can be used with almost any metal and provides what amounts to a new material, a rubber-metal composite whose dimensions can be held as closely as all-metal parts. Rubber surfaces as fine as five micro-finish are said to be possible.

The Dayton Rubber Co., Dayton, O., has announced that its roller division is now manufacturing letterpress rollers from a new superior synthetic material called Daycollan. The material is said to have unusual characteristics for superior ink distribution and easy wash-up. Daycollan rollers are non-porous, will not absorb ink. The new rollers are cast to size, are said to be perfectly round and entirely free of surface imperfections. They are not affected by temperature, humidity, or internal heat build-up from prolonged press runs. Daycollan is claimed to increase abrasion and wear resistance for longer roller life. The rollers are currently being manufactured for all sheet-fed press sizes.

Rubber Applicators, Inc., a division of Plastic Applicators, Inc., has installed extensive plastic and rubber molding equipment at its five-acre manufacturing site at 7020 Old Katy Rd., Houston, Tex. A supplier since 1951 of corrosion-resistant rubber linings for the food, chemical, transportation, pulp and paper, and mining industries, the firm is now filling orders for a variety of molded rubber products to be used by the petroleum and petrochemical processing industries and related suppliers. Such products as seals, O-rings, special gaskets, expansion joints, shock absorbers, cathodic protection posts and line crossing insulators are already in production. Molding facilitities are under the technical direction of Jack D. McComic.

The Pioneer Rubber Co., Willard, O., has been awarded a contract for proposals QM 36-243-59-NEG-77, labor surplus area set-aside portion of IFB 59-21, by the Military Clothing & Textile Supply Agency, Philadelphia Quartermaster Depot, Philadelphia, Pa. This procurement, for the U. S. Armed Services, covers men's rubber gloves. The award was for 33,030 pairs, at $1.001-1.063 each, for a total dollar value of $33,627.84. Also an award was made for proposals QM 36-243-59-NEG-61, labor surplus area set-aside portion of IFB 59-16, to **Charleston Rubber Co.,** Charleston, S. C. This proposal covers men's electrical workers rubber gloves. The procurement, for the U. S. Navy, was for 5,022 pairs, at $5.92 each, for a total dollar value of $29,730.24.

Kaufman Rubber Co., Kitchener, Ont., Canada, the Canadian licensee for Ripple soles, has introduced the Ripple sole for basketball shoes, after completing extensive tests which were said to have proved the versatility of this-type sole over conventional footwear now being worn by basketball players. The new construction is said to permit greater speed and maneuverability. Advanced sale of the new sole in Canada is reported to be most gratifying.

B. F. Goodrich Industrial Products Co., Akron, O., has announced a new canning belt said to have three times the moisture resistance of other belts used in the canning industry. The company's new Hydroseal fabric treatment protects internal reinforcement of the belt from moisture-induced rot, a major cause of failure in conventional canning belts. A rubber coating between the fabric plies offers additional protection against moisture and increases flexing life of the belt. These new "Green Pack" belts are said to be the first ever made with inhibitor-protected rubber that resists most fungi and molds. Green in color, the belts are available in any length, widths up to 48 inches, with from two to four plies of fabric reinforcement.

The American Standards Association, New York, N. Y., has appointed four new members to its materials and testing standards board. The members had previously been appointed to the administrative committee on standards of the American Society for Testing Materials and in that capacity represent the ASTM on the ASA board. The new members are: J. L. Menson, Combustion Engineering, Inc., New York; F. W. Reinhart, chief plastics section, National Bureau of Standards, Washington, D. C.; S. A. Rosecrans, materials engineering department, Westinghouse Electric Corp., East Pittsburgh, Pa.; and I. V. Williams, materials engineer, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Food Machinery & Chemical Corp., New York, N. Y., has licensed the Snia Viscosa group to use its new carbon bisulfide process in Italy. Ground will be broken this week for a plant at Varedo, near Milan, which will be Europe's largest carbon bisulfide installation. Completion of the plant is scheduled for 1960, with output to go chiefly to the rayon industry. The Snia group is among the largest rayon, viscose staple fiber and tire cord manufacturers in the world and also produces Nylon 6 and a polyamide fiber, "Rilsan." The Italian plant will use the process now in use at FMC's South Charleston, W. Va., plant which is a continuous, petrochemical type, and and will use the natural gas abundant in northern Italy. This is the first European license and is made available to Snia on a royalty basis.

Carolina Freight Carriers, Cherryville, N. C., has expressed great satisfaction with the appearance, service, and operating cost of trim, white open-top-trailer tarpaulins. These tarpaulins were fabricated by Austin Cushion Co., Charlotte, N. C., from fabric of nylon coated with Hypalon synthetic rubber by Reeves Bros., Inc., Vulcan Rubber division, New York, N. Y.

Girdler Process Equipment Division, Chemetron Corp., Louisville, Ky., has established a sales office for Thermex high-frequency dielectric heating equipment at 855 Board of Trade Bldg., Chicago, Ill. Frank Vance will be in charge of sales and engineering services from this office, which serves northern Illinois, Michigan, Minnesota, Wisconsin, Iowa, and part of Indiana. Thermex equipment is used in electronically heating, heat-setting, forming and treating non-conducting materials including plywood, plastics, foundry sand cores, rubber and vinyl foam, and in numerous other industrial heating applications.

Halocarbon Products Corp., Hackensack, N. J., has announced the commercial availability of a new unsaturated perfluoro compound, designated Perfluorobutene-2, said to be the only perfluoro organic monomer available on this basis. The material is a gas boiling at 0° C. Structural formula is $F_3C{\cdot}CF{=}CF{\cdot}CF_3$. This material copolymerizes readily with other monomers, but has not been homopolymerized by means of free radical initiators. Perfluorobutene-2 undergoes reactions common to fluoro olefins, including halogenation and the formation of β-H-perfluoroalkyl ethers. Commercial containers are 150 pounds and one-ton cylinders net.

Quaker Rubber Division, H. K. Porter Co., Inc., Philadelphia, Pa., reports that it has recently filled orders from a large toy manufacturer and distributor for 1¾ million feet of ¾-inch polyethylene pipe and for more than 150,000 feet from a second jobber in the South. The pipe was being used to make Hula Hoops. The company also announced that its laboratory revitalized the sale of plastic hoops by developing a candy stripe polyethylene pipe. Quaker also developed a 12-inch diameter hoop made from half-inch pipe, to be used to twirl around the arms while twirling the large hoop about the waist.

Sierra Engineering, Sierra Madre, Calif., is now making available to other firms the special skills and facilities it has developed in the field of precision molding of silicone rubber parts. It has for many years concentrated on the solution of the many difficult silicone rubber design and application problems arising from its manufacture of oxygen gear and other critical military and commercial equipment. Molding is available with tolerances as close as ± 0.002-inch on a thickness of 0.007-inch. Sierra has a staff of consulting engineers to assist in developing precision molded silicone rubber parts to provide solution to a wide range of design problems. Precision latex moldings are also available.

General Electric Co., Schenectady, N. Y., has announced that its "Polyseal," a silicone rubber insulation system, is now available on many G-E form-wound motors. The insulation is said to seal out moisture and contaminants and could eventually change many conventional motor application practices by eliminating costly protective enclosures on many existing-type motors. The system is offered at Class B temperatures, which are well below the thermal capacity of the "Polyseal" system, and means added life to the motor. Other features are low dielectric losses, long voltage endurance and resistance to mechanical abuses of operation. Because of the system's resistance to environmental conditions, the motors are adaptable for outdoor usage. The process of combining the rubber and tape was researched by the medium ac motor and generator department in conjunction with G-E's silicone products department, the insulating materials section, and the material and processes lab. Motors containing the "Polyseal" system are now available in most form-wound sizes from 150 to 1,750 hp.

Harris Products, Inc., Lynwood, Calif., pioneer in the manufacture of bonding, glass laminating, production food cooker, and rubber vulcanizing equipment, announces plans for a new facility on property adjacent to its existing plant. This structure will be devoted to the manufacture of hydraulic presses and systems for rubber, plastics, and general metal working and will employ cost-saving methods and the latest in plant layout. Design features of the new Harris hydraulic presses will be toward greater rigidity and strength, reduced deflection, and a substantial saving in overall prices. The new concern, to be called the Harris Machinery Mfg. Co., will be located at 11514 Wright Rd., Lynwood, Calif., P.O. Box No. 291.

Richard H. Mather has been named vice president in charge of production of the Firestone International Co., Akron, O. Mather, who joined Firestone in 1929, will direct manufacturing in 25 Firestone plants in 15 foreign countries. He has been general production manager of the International Company since 1948. He will headquarter in Akron.

B. F. Goodrich Flooring Products Co., Watertown, Mass., recently expanded its wholesale distributor organization by appointing the following new wholesale distributors: Eidelman Bros., Inc., Grand Rapids, Mich.; General Building Products, Asheville, N. C.; Millhouse Distributors, Cleveland, O.; Tennessee Tile Distributing Co., Knoxville, Tenn.; and Quinn Distributors, Inc., Milwaukee, Wis.

NEWS about PEOPLE

William L. Solt has been appointed director of advertising for Goodrich-Gulf Chemicals, Inc., Cleveland, O. He began his advertising career with the Mohawk Rubber Co., Akron, O., and before his recent appointment, was sales promotion specialist with B. F. Goodrich Tire Co., Akron, O.

John J. Sheehan has been appointed general manager of the international division of Hewitt-Robins, Inc., Stamford, Conn. He succeeds **Harold Von Thaden,** who is retiring after 35 years of service with the company, but who has been retained as a consultant. Sheehan joined the firm as controller of the Robins Engineers division, New York, N. Y., in 1947. He was made assistant to Von Thaden in 1951 and became manager of foreign operations in 1954. In his new position Sheehan will be responsible for all of the company's international activities, consisting of an export department in New York and subsidiaries and affiliates in Canada, Great Britain, Holland, France, and South Africa.

Kenneth R. Anderson has been appointed assistant manager of sales production coordination for the tire division, United States Rubber Co., New York, N. Y. He will assist in all customer service activities that are the responsibility of the sales production coordination department. He will make his headquarters at the company's Detroit, Mich., tire plant.

James Carpenter has been named factory manager of Dahlman Products Co., Redlands, Calif.

Del Holter has been named contracts administrator for American Latex Products Corp., Hawthorne, Calif., developer and manufacturer of C-Foam foam rubber and Stafoam urethane materials. **John N. Kempf** has joined the company as an adhesive chemist, concentrating on the potential applications of Stabond sealants and adhesives. **Glenn A. Wintemute** has been appointed manager of Pacific Polymers, Inc., researcher and developer of plastic and latex compounds and chemical intermediates, it was announced by American Latex Products.

Thomas B. MacDonald has been appointed plant engineer, and **John Kehn,** pilot plant engineer, at the Borden Chemical Co.'s polyvinyl chloride operation in Leominster, Mass.

John Fennebresque has been elected president of Texas Butadiene & Chemical Corp., Houston, Tex. He also becomes a director and a member of the executive committee. Mr. Fennebresque was formerly executive vice president and a director of Food Machinery & Chemical Corp. He has also been associated with the Celanese Corp. of America, where he was vice president and director and had served as general manager of the chemical division. He served two years in the Office of Rubber Director of the War Production Board during World War II and has also been on the chemical and rubber advisory committee of the United States Department of Commerce and on the board of directors of the Manufacturing Chemists Association. At Texas Butadiene, Mr. Fennebresque succeeds **E. L. Green, Jr.,** vice president of Cabot Carbon Co. and general manager of its oil and gas division, who was responsible for the organizing and building of the enterprise. Mr. Green will continue as a director and member of the executive committee.

Pach Bros., N. Y.

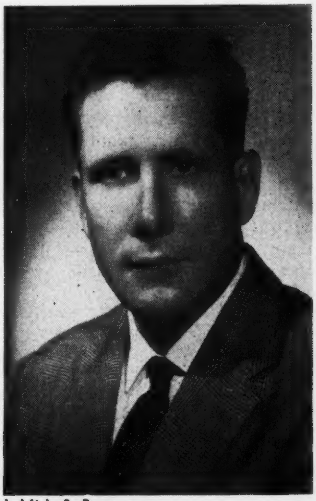
John Fennebresque

Dennis L. Mansfield, chemist, has become a member of Monsanto Chemical Co.'s organic chemicals division at the company's Nitro, W. Va., after having served with American Cyanamid Co. since 1955.

Major General Gerald J. Higgins has been named assistant to the president of The Dayton Rubber Co., Dayton, O., on military matters. Owing to his many years in government service, his experience will prove invaluable to the rubber company. General Higgins was graduated from West Point Military Academy in 1934. In 1944 he became the youngest Army officer to receive a battlefield promotion to Brigadier General. He held the rank of Major General when he retired in 1955 after commanding the 82nd Airborne Division.

L. George Hoth has been appointed manager of advertising and merchandising for the Borden Chemical Co., New York, N. Y. The promotion of Hoth, formerly merchandising manager of the consumer products department, followed consolidation of the company's advertising and merchandising functions into a single operation.

John J. Gorman has been named technical sales representative of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. He will serve customers in Missouri, Arkansas, Kansas, and parts of Mississippi, Illinois, Tennessee, and Indiana, from his headquarters in St. Louis, Mo. He joined Du Pont in 1955 as a rubber compounder in the elastomers laboratory and has been assigned to sales work in the Wilmington office for the past two years.



Lubitsh & Bungarz

John J. Gorman

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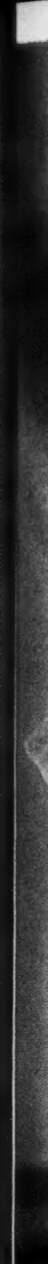

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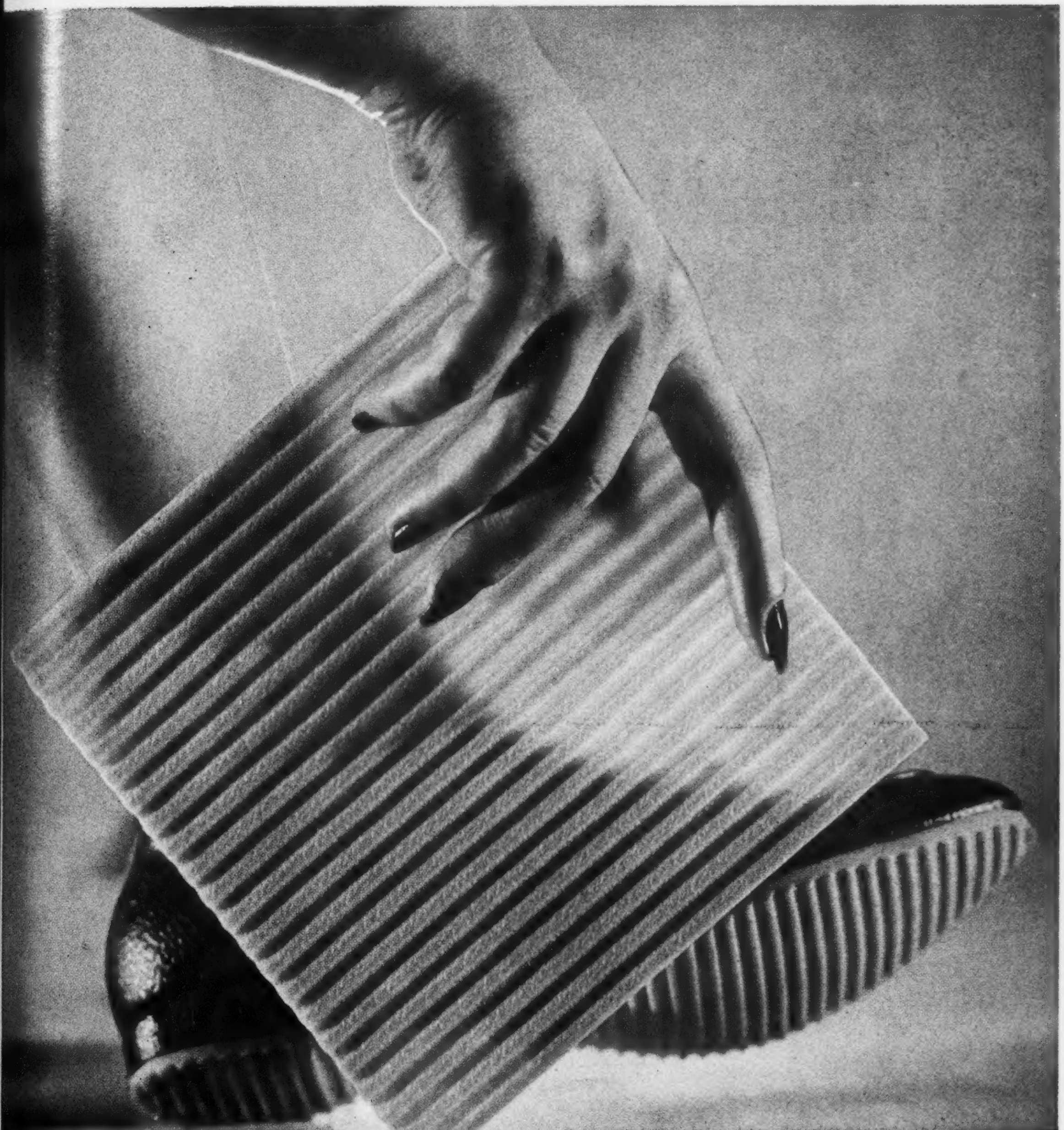

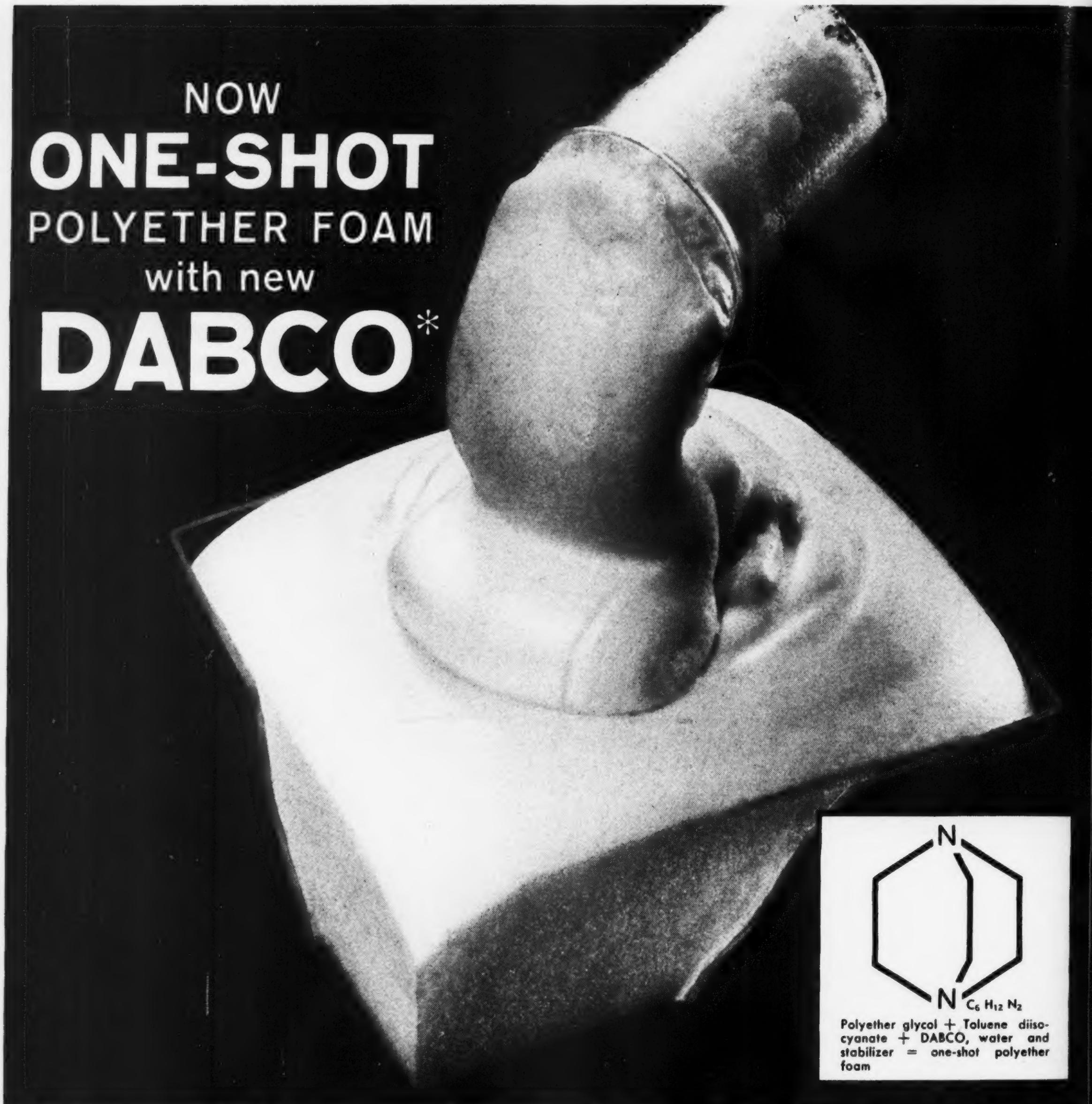

Now, you can produce odorless, flexible, semi-rigid or rigid urethane foams from all commercial urethane grade polyols . . . *in one simple, economical operation.* New DABCO gives you these production advantages:

- Fast cure • Prepolymer step eliminated
- Process in existing equipment
- Low catalyst concentration economy

DABCO produces foams with such good physical properties as:

- Low compression set • Uniform cell structure
- Excellent tensile, tear strength and elongation
- Dimensionally stable • Resistant to humid aging
- Good molding characteristics • No odor

DABCO is now used commercially here and abroad to produce polyether prepolymer and adipic acid ester type crash pads and polyether prepolymer and dimer acid ester foams for seating and load-bearing applications. Other fields are being explored for new DABCO, for which your inquiries are invited.

Write for complete information.

*HOUDRY PROCESS CORPORATION TRADEMARK FOR TRIETHYLENEDIAMINE

The structure and properties of DABCO suggest the following other possible areas of interest:

- Chain transfer agent in radical catalyzed polymerizations
- Activator for peroxide catalyzed polymerization
- Transesterification and cyanoethylation catalyst
- Complexing agent for metals

HOUDRY

PROCESS CORPORATION

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HOUDRY means Progress . . through Catalysis

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Madison Geddes

Glen E. Wilson

Glen E. Wilson becomes director of employe and public relations for Goodrich-Gulf Chemicals, Inc., Cleveland, O. Wilson, formerly director of employe relations with the firm, joined Goodrich-Gulf in May, 1956. Before that he had been employed by The B. F. Goodrich Co. in a variety of responsibilities after having joined that company in Akron, O., in 1928.

Thomas E. Moffitt, president, has been named by the board of directors of Hooker Chemical Corp., Niagara Falls, N. Y., to succeed **R. Lindley Murray,** board chairman, as chief executive officer. Murray has held the office since October, 1955, and Moffitt was elected president in November, 1957. Murray has agreed to continue as chairman of the board, a position he has held since June, 1951, and plans to remain in active service until December 1, 1959, as previously requested by the board. He will be fully available for consultation on all company matters.

Herchel M. Richey has been elected vice president in charge of manufacturing, Roller Bearing and Rock Bit divisions of The Timken Roller Bearing Co., Canton, O. He succeeds **A. M. Donze,** who retired October 31, but remains a member of the board of directors. Richey started with the company in 1916 as a toolmaker. In 1924 he was named foreman, in 1927 assistant general superintendent, in 1934 general superintendent, in 1940 assistant factory manager, in 1944 factory manager, Bearing and Rock Bit divisions, and in 1954 general factory manager. A. M. Donze, who retired as vice president, started with the firm in 1919. He progressed successively from production manager, assistant factory manager, then factory manager and was elected a director in 1940 and a vice president in 1943.

Norman P. Phillips and **James W. Hostettler** have been appointed product sales managers for the chemical division of The General Tire & Rubber Co., Akron, O. Dr. Phillips, as product sales manager for latex and polymer sales, will be responsible for the sale and sales development of latices, vinyl resins, polymers, and organic chemicals. Hostettler, as products sales manager for rubber and rubber chemical sales, will be responsible for the sale and sales development of synthetic rubber and chemicals sold to the rubber industry.

Robert H. Lane

Robert H. Lane has been appointed director of public relations of the Goodyear Tire & Rubber Co., Akron, O. Lane, formerly vice president of Carl Byoir & Associates, New York public relations firm, has for the past 11 years been account executive for that organization on public relations activities. Lane, 39, fills the post created by the retirement of **L. E. Judd** last June.

Robert J. Baker has been named purchasing agent, and **Donald H. Kattman,** assistant purchasing agent, for the Niagara Falls, plant and the Durez Plastics division of Hooker Chemical Corp., Niagara Falls, N. Y. Both men will report to **Charles W. Selover,** manager of purchases. The announcement was made by **Frank W. Dennis,** a senior vice president and chairman of the procurement committee.

Glenn D. Jackson, III, has been assigned as sales representative for organic chemicals for South Carolina, Georgia, and Florida for the Dewey & Almy Chemical division, W. R. Grace & Co., Cambridge, Mass. Jackson will sell the division's vinyl acetate polymer and copolymer emulsions, styrene butadiene latices and resins, plasticizers, and dispersing agents.

Pach Bros., N. Y.

Ross W. Bennington

Ross W. Bennington has been appointed director of traffic for United States Rubber Co., New York, N. Y. Bennington, traffic manager of the company since 1953 with responsibility for the movement of raw and finished goods, succeeds **James W. Harley,** who is retiring after 39 years of service with U. S. Rubber.

B. F. Benson is now market development manager of the industrial products division of Industrial Rayon Corp., Cleveland, O., and will be responsible for market development work connected with the use of the company's products. in industrial applications. Prior to joining Industrial Rayon in 1949, Benson was technical superintendent of Inland Rubber Co. and previously had been with The B. F. Goodrich Co. **Ralph J. Manica,** a member of the company's research staff since 1952, has been named head of the tire cord evaluation laboratory.

C. W. Taylor has been named manager of the newly created Vitel products development department, The Goodyear Tire & Rubber Co., Akron, O. Taylor, former process enginer in the Goodyear research division, has played an important role in the development of the new polyester material. The new department will handle problems of application and sales service for Vitel resins and Videne laminating film. In his new post Taylor will be responsible to **M. E. Wendt,** development manager for chemical materials and products.

Walter F. James, head sales correspondent, has been appointed manager of the export division of Neville Chemical Co., Pittsburgh, Pa. James, who has been with Neville for 22 years, succeeds the late **Richard Lauderbaugh.**

News about People

George J. Sella, Jr., has been made product manager in American Cyanamid Co.'s rubber chemicals department, Bound Brook, N. J., in charge of the commercial development of antioxidants and chemicals for the rubber industry. He has been with Cyanamid since 1954 in technical development, production, and sale of rubber chemicals.

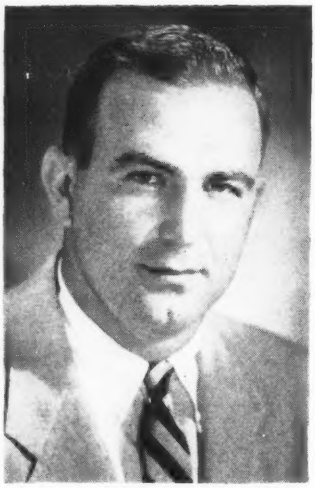
Robert E. Lee, Patrick W. Loftus, and **Ellsworth F. Benson** have been appointed salesmen for Jefferson Chemical Co., New York, N. Y. Lee and Loftus will report to the company's Chicago, Ill., office. Benson will report at New York.

John L. Collyer, chairman of the board, The B. F. Goodrich Co., Akron, O., will again serve as a member of the U. S. Olympic Businessmen's Committee endorsing the nation's participation in the 1960 Olympic games. **General Douglas MacArthur** will serve as chairman of the committee composed of 25 American business and industrial leaders.

D. Wallace Enright is one of four technical representatives who have been transferred by Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y. He transfers from the Charlotte, S. C., district to the Chicago, Ill., district. Other shifts include: **Alan J. Lyon**, from the general sales office to the Charlotte district; **Alan R. Mitchell**, from the New York district to the Philadelphia, Pa., area; and **Joseph L. Suhadolnik** from the general sales office to the Newark, N. J., district.

A. F. Thomas, manager, field sales, films and flooring division, The Goodyear Tire & Rubber Co., Akron, O., has announced three changes in the field organization of the company's packaging films sales department. **W. R. Berkinshaw**, packaging field representative at Los Angeles, has been assigned in the same capacity to San Francisco, Calif., replacing **D. L. Abshire**, transferred to the Los Angeles district office. Los Angeles district staff member **W. M. Story** assumes the post vacated by Berkinshaw.

Gilman S. Hooper has been named vice president in charge of research, and **L. Louis Malm** vice president in charge of engineering for Industrial Rayon Corp., Cleveland, O. Dr. Hooper, who started with the company's high polymer research division in 1949, became assistant manager of high polymer research in 1951 and, a year later, was appointed manager of that division. He was made director of research in 1957. Malm had been chief engineer for the company since 1949.



George J. Sella, Jr.

Markus D. Royen

Walter E. Lyon

Victor J. Baxt has been elected vice president and general manager of Thompson Chemical Co., Pawtucket, R. I. The firm manufactures polyvinyl chloride resins, plasticizers for the plastic industry, and automotive chemicals. It operates plants at Pawtucket, R. I., and Hebronville, Mass.

J. E. Watson, Jr., manager of the Miami, Fla., district of Allis-Chalmers Industries Group, has been appointed manager of the firm's New Orleans, La., district. He succeeds **R. F. Muller**, who retired October 1 after 38 years of association with the New Orleans district. Watson came to Allis-Chalmers in 1949 and was a representative in the Birmingham, Ala., office before being transferred to Miami in 1951. **W. E. Scott**, sales representative in the Charlotte, S. C., area since 1952, becomes manager of the Miami district.

Markus D. Royen has been elected vice president and director of research for Apex Tire & Rubber Co., Pawtucket, R. I. Dr. Royen obtained his early education in Poland and his advanced training at the Institute of Technology, Danzig, Germany. He has worked for the rubber firm "Gentleman" at Lodz, Poland, and then came to H. O. Canfield, Bridgeport, Conn., before joining Apex Tire in 1945.

Obituaries

Walter E. Lyon

Walter E. Lyon, 55, director of tire engineering and development for The Firestone Tire & Rubber Co., Akron, O., died October 4 at an Akron hospital.

He was an international authority on tires of all types. He joined Firestone in 1929 in the college training class and later the same year entered the tire field in which he gained preeminence. In 1940 he was named manager of the tire engineering department and then in 1950 manager of tire development. He was appointed head of the combined departments in 1953.

During the Second World War, Mr. Lyon served the government and the military as an advisor on several committees and in development of military tires. He authored many technical papers and was the holder of many patents on improved designs and construction of tires.

He served as president of The Tire & Rim Association of the United States, and he made major contributions to the standardization of tires and rims. He was a member of the Society of Auto-

motive Engineers and chairman of its Akron Section. He was also a charter member of the United States Auto Club.

The deceased, who was born in Walton, N. Y., was graduated from Cornell University in 1929 with a degree in mechanical engineering.

Surviving Mr. Lyon are his wife, two daughters, a sister, and a brother.

Theodore E. Werkenthin

Theodore A. Werkenthin, head materials engineer, head of the Elastomer Branch of Research & Development, Bureau of Ships, Navy Department, Washington, D. C., died in a local hospital on October 7 following an operation. He had returned to his desk in September following a previous operation in May.

Mr. Werkenthin became associated with the Navy in 1937 after having worked for various oil companies including White Eagle Refining Co., a Standard Oil Co. of New York subsidiary, Augusta, Kan.; Grayburg Oil Corp., San Antonio, Tex.; and Deep Rock Oil Corp., Cushing, Okla.

He had received his B.A. and M.A. degrees from the University of Texas and had done work on his doctorate at his Alma Mater in 1924 and again in 1935. During his period of service with Deep Rock he became interested in rubber goods manufacture and development in connection with the improvement of packing, gaskets, and hose exposed to petroleum products.

The rubber laboratory at the Mare Island Naval Shipyard in California was conceived and administered by Mr. Werkenthin. The Munitions Board assigned to the Rubber Section the task of evaluating prewar German synthetic rubber and the newly developed American synthetic and natural rubbers, and much of the information obtained became the background for the famous Baruch Report. Mr. Werkenthin built up the Bureau of Ships' rubber interests so that it now includes four rubber goods manufacturing shops and eight laboratories where now scores of rubber chemists and technologists are working constantly to improve the quality of rubber products used by the Navy.

In 1945 the Navy awarded the deceased the Meritorious Civilian Service Certificate for his outstanding work on rubber in World War II, and in 1951 the Distinguished Civilian Service Award was presented to Mr. Werkenthin by Under Secretary of the Navy, Hon. F. P. Whitehair.

Mr. Werkenthin was a member of the American Chemical Society and its rubber and petroleum divisions, the American Society of Naval Engineers, the American Association for the Advancement of Science, the Scientific Research Society of America, Sigma Xi, and Phi Lambda Upsilon. He was also the founder and first president of the Washington Rubber Group.

Theodore A. Werkenthin

The deceased was born in Berlin, Germany, in 1900 and resided in the United States since the age of one.

Funeral services and burial took place in Augusta, Kan., on October 11. Surviving Mr. Werkenthin are his wife and a brother.

Paul E. L. Bruck

Paul E. L. Bruck, salesman with Stein Hall & Co., Inc., New York, N. Y., died suddenly on October 9 following a heart attack. He had been with the company since June 1, 1953, when he joined it as a latex salesman and compounding specialist. In 1956 he became New York Branch office salesman to textile and latex accounts in the Metropolitan New York area.

Mr. Bruck, who was born in Germany in 1901, was educated at the University of Frankfurt. Prior to joining Stein Hall, he had been sales manager and treasurer of Rubber Corp. of America.

Interment took place on October 13. Mr. Bruck is survived by a daughter, his mother, and brothers.

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Great Britain

New Booklet on NR Grades and Contracts

The Federation of British Rubber & Allied Manufacturers (FBRAM), London, recently published a booklet, "National Rubber Grades and Contracts," which, as the director of the Federation, Stuart C. Covell, explained,[1] gives details of the procedure suggested that consumers of natural rubber could follow to insure that the quality of the rubber delivered to them fully meets the standard contracted for. It is not intended in this booklet to set out rules which must be followed by consumers buying on the basis of the Rubber Trade Association of London contract or of any other contracts, but merely to call attention to and explain the existing rights and facilities available to them.

The purchase of natural rubber is a complicated and difficult task, and the question of quality and weight control must be carefully considered because natural rubber is an agricultural commodity produced by varying methods, under varying conditions of size, soils, and climate of estates, which all affect quality; while, finally, packing and shipping frequently are out of the control of the producer.

As the booklet stresses, consumers of natural rubber can protect themselves against substandard deliveries if they make proper use of the agreed international quality and packing standards, together with the safeguards provided the buyer in contracts based on the official contracts of the RTA of London or other recognized world markets. While written primarily for use of consumers in the United Kingdom, the booklet, it is hoped, may prove useful to consumers and others interested in natural rubber throughout the world.

[1] *Rubber J. & Internatl. Plastics*, June 7, 1958, p. 870.

Industry Notes

An irradiation laboratory designed to make irradiation service available to companies and organizations interested in electron irradiation for industrial purposes has been built at the Metropolitan-Vickers Barton Works. Among applications provided for will be the curing of rubbers and processing of plastics, including polymerization cross-linking, chain scission, and graft polymerization. Specific investigations will be undertaken, and a certain amount of contract work will be handled.

Michelin Tire Co. has begun construction of a new tire factory at Burnley, Lancashire. Estimated to cost between £3,000,000 and £4,000,000, the factory is expected to be in production by the beginning of 1960. It will concentrate on making heavy X tires, with initial daily output at about 500.

Dunlop Report

In his annual report, G. E. Beharrel, chairman of Dunlop Rubber Co., Ltd., revealed that the output of synthetic

(*Continued on page 270*)

NEWS from ABROAD

Germany

Machinery Output

The machinery produced in Western Germany during 1957 for processing in the rubber and plastics industries is officially stated to have included the following:

	Tons	D. Marks
Injection and compression molding machines for plastics	1,355	20,300,000
Roller mills and calenders, including accessory equipment	3,759	22,400,000
Disintegrating machines, mixers, kneaders, mixing mills	1,871	12,800,000
Extruders, including accessory equipment	1,579	19,900,000
Mechanical and hydraulic presses, excluding tire heaters	4,172	16,400,000
Dipping and spreading machines, gelatin equipment	439	3,200,000
Injection machines, excluding molds	3,826	31,600,000
Vacuum molding and other forming machines	109	900,000

Bunawerke Huls Cold Rubber Plant Opening

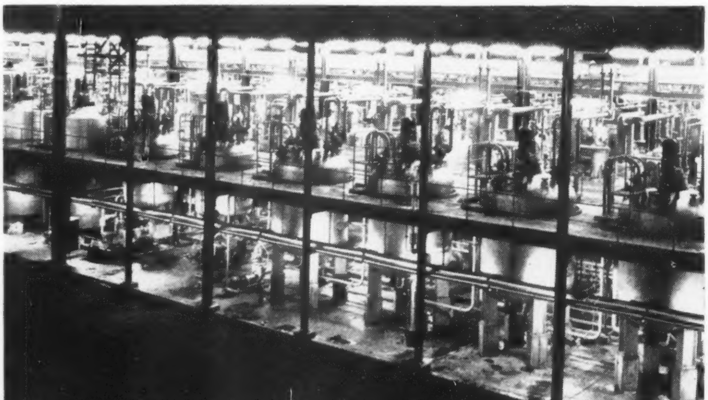
As reported earlier[1] large scale-production of cold rubber was started at the Marl factory of Bunawerke Huls G.m.b.H. On September 15, a few weeks after operation began, the works were officially opened, and to commemorate the occasion a profusely illustrated 205-page book was issued in which was presented an account of the history of the factory as well as details of the processes employed, the planning, construction, and equipment.

The founder companies of Bunawerke Huls are Badische Anilin & Sodafabrik A.G., Leverkusen; Farbenfabriken Bayer, A.G., Ludwigshafen; Chemische Werke Huls A.G.; Farbwerke Hoechst A.G., vormals Meister Lucius & Bruning, Frankfurt (M)-Hoechst.

The company, formed in 1955, with a capital of 120,000 DM., now is capitalized at 42,000,000 DM., in which Chemische Werke Huls has a 50% interest; while the other three companies participate equally in the remaining 50% through a holding company. The enterprise has required the investment of a total of 180,000,000 DM., including 114,000,000 DM. for the butadiene and polymerization plants and storage facilities, a further 36,000,000 DM. for facilities set up by Chemische Werke to provide styrene and catalyst, energy and water supplies, streets and railway lines, etc., and finally about 30,000,000 DM. as working capital.

The Houdry and C.A.A. (Esso Research & Engineering Co.) processes are used for the production of butadiene. Layout and procedure for the Houdry process differ somewhat from those in the United States in that Bunawerke has installed six large reactors in two parallel rows of three reactors each (instead of a single line of reactors, as in the United States) operating so that only half the reactors have to be closed down at one time when catalyst has to be changed. Then, too, at Marl, waste heat is used in indirect heat exchangers to heat fresh air; whereas in the United States waste heat is used to produce steam.

[1] RUBBER WORLD, Sept., 1958, p. 923.



Cold SBR polymerization tanks at Marl Bunawerke Huls G.m.b.H. plant

Small Tire Press

To meet the increasing demand for smaller tires for the small cars that are becoming so popular, Leonh. Herbert Maschinenfabrik, Bergen-Enkheim, has added to its line of "Aubo" tire vulcanizers the "Aubo 25" for 8-12-inch tires.

This press, one of the new developments seen at the Hannover Fair, held April 27-May 6, uses no heating bags and is said to be the first machine specially designed for curing small automobile tires. Among the advantages claimed for it is that it helps reduce curing times considerably.

New V.G.F. Factory

In May, 1957, the Vereinigte Glanzstoff-Fabriken, A.G. (V.G.F.) opened a new factory in Obernburg for the production of nylon cord for the German tire industry. V.G.F., which has been producing cellulose-based rayon cord since 1937 and began making Perlon (Nylon 6) in 1950 for the hosiery and textile industries, decided in 1955 to add the manufacture of Nylon 66 tire cord. The main difference between the two types of polyamide fiber is that Nylon 66 has a higher melting point than Perlon, that is 250, against 215° C., an important point in favor of Nylon 66 for tires.

Malaya

Plans for Increasing Smallholder Output

The Malayan Government has taken new steps to push its plans for improving and increasing rubber production by smallholders, and incidentally also for aiding the growing of food and other crops.

As is known, the government's rubber replanting scheme for smallholders started in 1953, aimed at replanting 480,300 acres by the end of 1959. The annual report of the Rubber Replanting Board indicates that 187,335 acres had been replanted by the end of 1957,

with 1957 itself a banner year for the scheme, with a record total of 52,940 acres replanted. The report states that smallholders in the scheme are now more ready to comply with requirements as to land preparation, and mechanical means are being employed in Johore and Malacca. Some smallholders have replaced their old rubber with fruit trees or coffee and are earning good incomes. The improved "Emergency" situation (terrorists raids) has led small owners, who left their holdings in danger areas, to return, and they are showing interest in replanting; group replanting has had some success. Though these are encouraging signs, the rate of replanting leaves something to be desired; there are still thousands of acres to be replanted.

Accordingly on October 1, the government launched a nation-wide campaign to acquaint the 350,000 smallholders in the Federation with the advantages of replanting in order to get as many as possible to register with the Rubber Industry Replanting Board and to qualify for financial aid in replanting. Experts will visit every kampong and village to demonstrate by photographs, models, and the like the need of replanting, the various methods to be used, the right and wrong way of doing things, eradication of the destructive lallang weed, the use of fertilizers, etc.

New planting of rubber is also getting attention. Experts and others have long been urging the need of extensive new planting, and now after years of planning, the government's $30,000,000 (Straits) scheme for new planting by smallholders is under way. According to the *Malay Mail*, many hundreds of acres of new rubber are being planted throughout Malaya. The funds provide for a total of 75,000 acres to be allocated, and of the 11 states in the Federation, ten have either made a concrete beginning or have advanced plans for starting in 1960.

Relatively small-scale schemes as well as more ambitious projects are on the program. The acreages involved in the latter are extensive enough to require the establishment of new communities. Thus 400 Malay families have already been settled on the 4,000-acre Ayer Lanas scheme in Kelantan, the most advanced in the country; here 1,200 acres of rubber land were being planted in September, 1958. One of the largest projects is the Bilut Valley Scheme, in Pahang, with a total of 12,000 acres of land, of which 8,400 will be allocated for rubber planting. According to latest reports, 5,000 acres of land were already opened up here; people of all nationalities are to be encouraged to settle here and plant rubber as well as food and other crops. It seems that it is hoped at the same time to be able to help hundreds of unemployed mine workers to make a living for themselves. The government reportedly will grant each settler a loan of $50 monthly for a year to get him started, in addition to a gift of $400.

Much smaller schemes have been started in the States of Negri Sembilan and Kedah; so far, it is reported, 1,164 acres have been planted on two projects in the former state and about a thousand in various schemes in Kedah. In Johore, 2,000 acres of rubber and 1,000 acres of paddy land are planned, and in Trengganu, 2,400 acres are to be planted to rubber and 1,200 acres to other crops.

Wage Settlement Near?

The dispute between the employers' association (MPIEA) and the plantation workers' union over a new wage scale has now dragged on for nine months. To the end of September, no agreement had yet been arrived at, although prospects for a settlement seem a little brighter.

Employers delayed beyond September 15, 1958, the final date set by the union for a reply to its demands, but both sides have recently expressed themselves hopeful of an early and satisfactory arrangement of the matter. As a basis for further discussion, the MPIEA offered a "peace plan," details of which have so far not been available. Hitherto the union has been insisting on a minimum wage and a wage system that is not tied to the price of rubber; while the MPIEA has been equally steadfast in rejecting the latter proposal, at any rate. Whether the MPIEA's "peace" offers include any direct concessions on the wage/price deadlock, is not known, but does not seem likely. In any case, the offer will be subjected to much discussion by the union, seeing that it adds up to a wage well below the basic $3.00 daily demanded by the workers.

Meanwhile, the plantation workers are benefiting because the employers have continued to pay wages on the basis of the rubber price average. During the third quarter of 1958, wages had been based on the 60-80 cents per pound price zone, within which the average price for the preceding quarter fell. The average price for the quarter ended September 30, 1958, came within the 0.80-$1.00 zone (it was above 80 cents per pound), and workers accordingly get a raise in pay of 30 cents (Straits) a day, effective October 1, 1958-December 31, 1958.

Foam Goods Production; Rubber to Brazil, Etc.

The foam latex factory opened in 1956 by Dunlop Rubber Co. (Malaya), Ltd., at Bahau Estate, Negri Sembilan, has been extended to meet increased local demand for the company's foam latex mattresses and pillows. The factory, which employs 50 workers, is equipped with modern machinery and uses the same methods as in England. Not only can all Malaya's needs of these goods be met, but there is a surplus for export. Already a market has been established in Hong Kong, and plans are afoot to export to other nearby countries as well. Until the factory at Bahau was opened, Dunlopillo products had been imported from Britain. The company still imports sporting goods from the English factories for the Malayan market, as well as thermoplastic tiles, for which there seems to be a great demand here.

Brazil has recently been buying more rubber from Malaya. Able to produce only about half her requirements of rubber, now put at 50,000 tons annually, she had been importing most of the balance from Indonesia, but the troubled conditions in that republic has caused a switch to Malaya. In 1956, Brazil imported 5,770 tons from Malaya; last year the total was 9,393 tons, and the amount for the first half of 1958 is set at 6,166 tons. The expanding rubber industry in Brazil is expected to consume about 65,000 tons annually by 1965, of which only about 25,000 tons could be supplied from local sources. But the difference is likely to be made up to a substantial extent by SBR, since apart from other considerations, the uncertainties of the political situation in southeast Asia do not encourage reliance on this area for supplementary amounts of rubber.

Capital in Malaya gave a lower yield than investment in Britain, the board of Alar Pongsu Amalgamated Estates, Ltd., found, and this reason was offered as one of the main ones for the company's decision to sell all the four rubber estates it owns in Malaya. The estates have a combined area of 3,247 acres.

Great Britain

(*Continued from page 267*)

rubber at the Fawley plant of International Synthetic Rubber Co., Ltd., would be considerably higher than originally estimated. In 1957 it had been expected that by the Fall of 1958 production of synthetic rubber would be at the rate of at least 50,000 tons per annum. The Fawley works started operations in March, 1958, and it became evident that when full production was reached in September, 1958, the rate would be at least 70,000 tons. The chairman of the Dunlop concern, which owns 45% of the shares of International Synthetic Rubber, added that Fawley could probably produce considerably more than 70,000 tons a year without any significant further capital expenditure.

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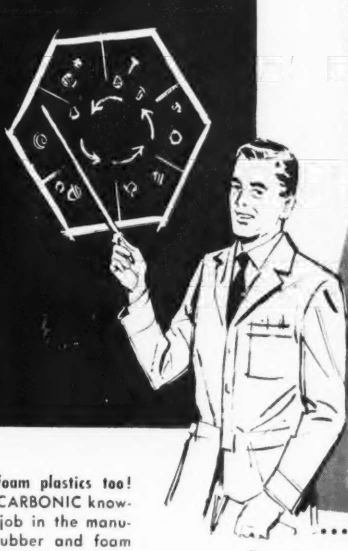

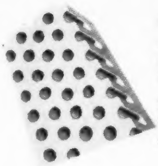

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NEW EQUIPMENT

Automatic record for Select-o-Weigh systems

Automatic Typewriter Readout

Automatic control of a typewritten record of weights of individual ingredients as well as batch weights is now offered by the Richardson Scale Co., Clifton. N. J., for use with its Select-O-Weigh proportioning systems. Other related information such as time, date, batch number, etc., can also be recorded automatically by this new typewriter readout, it is reported.

A special feature added to the typewriter is a new column verifier. This is a printed circuit attached to the typewriter carriage which operates through a checking circuit to insure that the data being typed out is recorded in the correct columns.

In addition to standard typewriter features, all keys on this readout are solenoid operated, d.c. Maximum typing speed is 11 characters per second, and carriage length is available up to 27¼ inches. A special interlock switch regulates typing sequence and speed.

An indexing printed circuit is arranged so that if the typewriter carriage is out of sequence with the serial input circuit, the printing cycle will stop. The carriage must be properly alined under the correct columns in order to continue operation. This is unique with the Richardson system and, so far as is known, is not employed elsewhere, having been designed and developed by Richardson especially for this device.

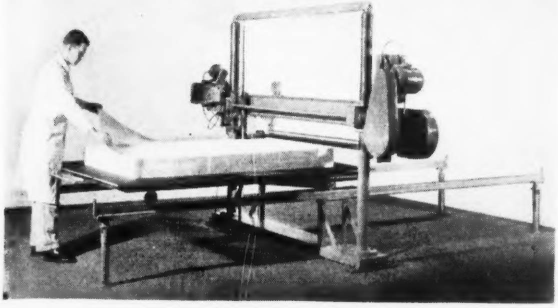
The typewriter readout may be used for printing individual net weights of each commodity, material, or item and the total weight; or it may be used to print accumulated amounts and total weight. It is also used for billing, in which case customer's name, address, and additional information may be typed manually or automatically by prepunched cards.

New Femco Splitter

The Falls Engineering & Machine Co., Cuyahoga Falls, O., has added a new low-price model to its line of splitting equipment. The machine is said to have such features as a vertical power-driven head, interchangeable guide bars, automatic adjustable hold-down compressor roll, all-steel heavy-duty construction, and it will require only one operator. It can be installed in about four hours, it is reported.

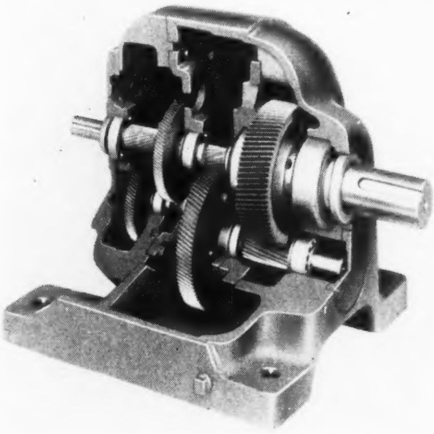
Enjay Butyl is used in General Electric washers and refrigerators because it offers economy and outstanding all-round quality performance.

New Equipment



Foam rubber splitter

The machine will handle blocks of synthetic foam up to 30 inches thick, cut them into sheets ranging from $\frac{1}{16}$-inch to six inches in thickness. Femco officials expect the new manually operated 72- by 96-inch model to sell for less than half the cost of its other models. The company's line of splitters are designed by Campbell Machinery Development Co., Cuyahoga Falls, O.



Cutaway view of Link-Belt's new quadrup'e reduction helical gear drive

Helical Gear Drives

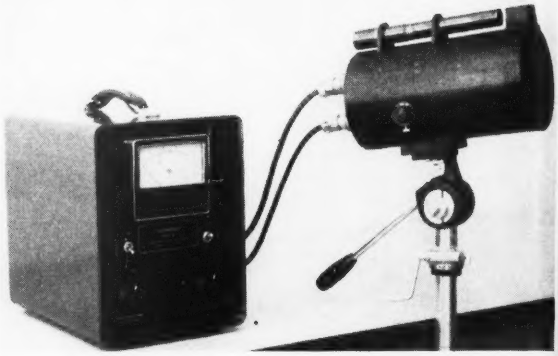
Link Belt Co., Chicago, Ill., is offering industry a quadruple reduction helical gear drive and new larger sizes of double and triple reduction drives to augment its present line of double and triple reduction In-Line helical gear drives. Drives with capacities to more than 200 hp. are available.

The extremely compact quadruple reduction speed reducer, available in five sizes, extends the range of ratios as high as 2,217:1. The simple gear arrangement of these speed reducers consists of helical gear trains operating in high-capacity ball and roller bearings mounted in a cast-iron housing.

Space requirements and layout problems are minimized by placing input and output shafts in the same horizontal and vertical planes. Automatic splash lubrication of all moving parts assures dependable lubrication and dependable operation of all speeds.

Folder 2651A, a recent six-page supplement to Link-Belt Book 2651, provides complete data on horsepower ratings, dimensions, and mounting information and contains a résumé of construction principles applying to the new quadruple drives. Similar information is furnished on the new sizes of double reduction and three new sizes of triple reduction helical gear drives. The folder is available from the company.

New Equipment



New tire temperature measuring device

New Tire Temperature Device

Radiation Electronics Corp., Skokie, Ill., has developed a remote temperature measurement instrument to determine the temperature distributions over the surface of high-speed rotating tires. The equipment has been designed and constructed for reliable operation under ambient conditions of tire testing and other plant locations. Several types of measurements may be accomplished: the measurement of average temperature at a fixed radial distance from the axis of rotation; temperature variations at a fixed radial distance (for location of hot spots); and radial temperature variations detected by rapidly scanning across the tire wall.

The unit consists of a scanning optics and control unit. The optical unit contains the scanning mirror, collecting mirror, infrared radiation detector and a preamplifier. This unit occupies about one cubic foot and is conveniently oriented or mounted for a given scanning situation, claims the manufacturer. The control box contains power supplies and controls for the electronic and scanning operations.

Measurements are taken remotely, from a distance of four feet or more, by optically collecting the infrared radiation emanating from small areas on the tire. Temperature profiles of rotating tires are readily measured and displayed as an amplitude modulated oscilloscope trace. Points of increased temperature appear as pulses on the oscilloscope; the amplitude of the pulses is directly related to temperature.

It has been possible, it is reported, with this instrumentation to measure average temperature from 40 to 800° C. with a precision of 1° C. or 1%—whichever is larger. Temperature differences of ±2° C. about the average may be observed for radial and circumferential scanning. This system can also be modified for application in other industries.

Lift and Roll Unit

A new materials handling unit, called Lift and Roll, has been developed by Special Machine Co., Winsted, Conn. These units, which can be used either in pairs or in double pairs, have been proved in service for use in handling crated or skid-mounted objects weighing a ton or more. Lifting is accomplished by an adaptation of eccentric axles operated by a hand lever which raises one end of the load off the floor. The operating lever moves through an angle of 90 degrees locked in place after the load has been raised in such a way that the load cannot drop.

Studded angle plates on which the load rests, when raised, prevent the load from slipping, by biting into the crate or skid on which the load is mounted. Plain or anti-friction bearings in the wheels can be furnished to users' requirements.

Literature, giving specifications, operation instructions, and illustrations, is available from the company.

NEW MATERIALS

Witco Fomrez No. 50

Fomrez No. 50, a glycol-adipate type of polyester resin for use in the production of flexible urethane foams, is one resin of a new series now commercially available from Witco Chemical Co., Inc., New York, N. Y. Foaming formulations based on this new material are said to process easily, making foams of low density. Such foams have uniform, fine cell structure, possess low initial compression set and good humidity aging characteristics.

A typical analysis of Witco Fomrez No. 50 follows:

Hydroxyl number	49–55
Acid number	2.0 max.
Water content (Karl Fisher)	0.1% max.
Color (Gardner 1933)	3.0 max.
Viscosity (Brookfield Model LVF, Spindle No. 4, 12 rpm), 25° C.	17,000–22,000 cps
Specific gravity @ 25° C.	1.19
Appearance	clear

Fomrez No. 50 is adaptable in both the one-shot and the two-shot or prepolymer foaming systems. In the one-shot system all of the components of the formulation are mixed simultaneously in the mixing head of the foaming machine. This system has the advantage of simplicity of processing since no prereaction step to prepare a prepolymer is necessary. Consequently, production costs for foams produced by this method are generally lower. There is also more latitude for formulation changes.

In the two-shot method of foaming two steps are involved. The resin and the toluene diisocyanate are first reacted to form a prepolymer which is then mixed with the activator solution (mixture of the water, catalyst and coupling agent) to form the foam. A technical service bulletin giving formulation data, curing information, and specifications is available from the company.

Stabilizer Mark LL

Stabilizer Mark LL, a liquid barium-cadmium stabilizer of a new improved type is now being marketed by Argus Chemical Corp., Brooklyn, N. Y. Evaluation of Mark II in many different vinyl formulations indicates it to be 20-30% more effective than previously available barium-cadmium liquids.

Mark LL is a general-purpose stabilizer and is recommended for use in calendering, extrusion, plastisols, injection molding, and solutions. It is said to have excellent heat and light stability and it may be used in all suspension homopolymer resins. Also, plasticizer choice does not materially affect the stabilizing efficiency of Mark II; it is equally effective with ester type and aryl phosphate type plasticizers.

Some typical properties of Mark II follow:

Composition	barium-cadmium complex organic salt
Form	clear amber liquid
Odor	slightly aromatic
Specific gravity	0.986 at 25° C.

A technical data sheet, giving information on formulating, calendering, extrusion and injection molding, plastisols and organosols, and solutions with Mark II, is available from the company.

New Materials

Turpol NC 1200

Turpol NC 1200, a soft, rubbery, terpene-derived synthetic polymer that acts as an efficient rubber plasticizer and processing aid, has been introduced by Irvington chemical division, Minnesota Mining & Mfg. Co., Newark, N. J. The general chemical resistance of plasticized compounds containing Turpol NC 1200 has led to their acceptance for a variety of applications.

Neoprene, nitrile, SBR, Thiokol FA, Thiokol ST, butyl, Hypalon 20, natural rubber, and Fluoro-Rubber 1F4 compounds are being plasticized with this material. This wide range of compatibility has resulted in its use as an additive to already highly plasticized stocks to provide further softening without danger of bleeding. Such compatibility offers the opportunity of obtaining maximum solvent resistance with minimum hardness by blending plasticizers or, in some cases, by blending rubbers.

When used as a processing aid, Turpol NC 1200 exerts a softening effect upon the harder, tougher, drier rubbers; it imparts a cohesiveness to all rubbers during the mixing process. Also, mold flow, particularly in transfer molding, is aided by the addition of this material.

There have been some indications that Turpol NC 1200 improves the ozone resistance of neoprene compounds at very high ozone concentrations (150 ppm). This type of protection is believed to be of a surface nature similar to protection by waxes.

Some typical physical properties of Turpol NC 1200 are as follows:

Hardness Shore A	5–10
Specific gravity	1.20 at 25° C.
% Ash	nil
Color	amber
Odor	mild terpene
Solubility	resistant to all common solvents
Storage stability	excellent
Toxicity	none under normal conditions

Orion Red CP-1300

Orion Red CP-1300 is a new-type metallic salt azo red pigment now available from the pigment color and chemical division, The Sherwin-Williams Co., Chicago, Ill. It has exceptionally bright yellowish-red shade and is very opaque. CP-1300 has excellent heat resistance, very good bleed resistance, and fair resistance to light. It is an easy grinding pigment. Thus Orion Red's bright shade combined with good heat resistance and other good properties makes it a useful pigment to the rubber industry.

Some typical properties of Orion Red CP-1300 are reported as follows:

Specific gravity	1.59
Weight per solid gallon (lbs.)	13.24
Bulking value (gal. per lb.)	0.07553
Oil absorption	38
Light resistance	fair
Resistance to	
Water	good
Acid	good
Alkali	good
Soap	poor
Bleeding in plasticizers	very good
Naphtha	excellent
Toluene	very good
Alcohol	fair
Lacquer solvents	good
Paraffin	excellent

Technical bulletin, C-27, which gives more information about Orion Red CP-1300, can be obtained from the company.

New Materials

Dihalo—Rubber Modifier

A novel halogen carrier, designated Dihalo, has been introduced by Bromine Producers Co., Adrian, Mich. It is said to be applicable as a drying oil or a drying-resin mixture modifier, as a rubber modifier, and as a modifier for oil extenders used in the rubber industry. It is unique among halogen carriers in that it supplies an active bromine and an active chlorine. This new product, N-bromo-N-chloro-dimethyl hydantoin, reacts with unsaturates to introduce the hydantoin ring as well as bromine and chlorine into the chain.

When introduced into the rubber polymer, Dihalo generally increases polarity and modes of vulcanization. With butyl, for example, the resultant rubber may be vulcanized by metal oxide systems. When Dihalo is used as a modifier for oil extenders, the presence of the halogen allows cross-linking into a rubber system, particularly where a neoprene-type vulcanization is being carried out.

Some typical physical properties of Dihalo are reported as follows:

Appearance	free-flowing white powder
Odor	faint halogen
Molecular weight	241.5
Melting point	163–164° C.
Active bromine	minimum 33%
Chlorine	minimum 14%

Further information should be obtained from the company.

Kesscoflex DOZ

Kesscoflex DOZ, a plasticizer, is available from the Kessler Chemical Co., Inc., Philadelphia, Pa. The material, chemically known as di-2-ethylhexyl azelate, is an excellent low-temperature plasticizer for vinyl resins. In polyvinyl chloride it is said to be more efficient and less volatile than DOP. Plastisols prepared with it have low initial viscosities and excellent shelf life. Resin compositions containing it have excellent heat and light stability, it is also claimed.

Kesscoflex DOZ contributes low-temperature flexibility to synthetic rubber. It is compatible with polyvinyl chloride, polyvinyl chloride-acetate copolymers, common synthetic rubbers, and other materials.

Some specifications and average physical properties of Kesscoflex DOZ follow:

Color A.P.H.A. Pt-Co	150 max.
Odor	mild, characteristic
Acidity	0.1%
Specific gravity @ 25°/15° C.	0.914 ± 0.004
Moisture	0.1 max.
Flash point (open cup)	420° F.
Fire point	465° F.
Pour point	− 63° C.
Freezing point	− 68° C. (gel)
Viscosity @ 25° C.	18 cp.
Pounds/gallon @ 25° C.	7.6

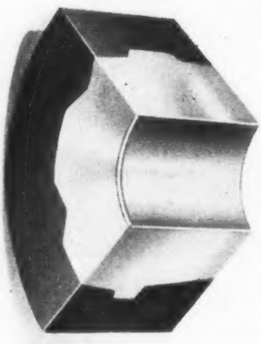
Technical data sheets describing the company's most recent plasticizers and a 48-page booklet describing other plasticizers are available from Kessler.

•

"Igepon Surfactants." Antara Chemicals, division of General Aniline & Film Corp., New York, N. Y. 16 pages. This booklet covers the properties and uses of the Igepon series of anionic surfactants. It describes the chemical derivation of Igepon (alkyl sulfo-amides and alkyl sulfo-esters synthesized from fatty acids and organic sulfonates) and gives the chemical formula, functional properties, and uses of each of the brands.

NEW PRODUCTS

New Industrial Tire



Cutaway of Durothane wheel

Durothane is the trade name announced by Divine Brothers Co., Utica, N. Y., for a new polyurethane industrial tire. Produced entirely of domestic chemicals, this new elastomer is cast directly to the wheel rim in a full range of standard sizes for lift trucks, pallet trucks, factory trucks and casters, and other applications. It is said to reduce the draw-bar-pull of a fully loaded truck by as much as 30%.

The tire features a mechanical locking device to supplement the adhesive tire bond, thus preventing a separation of the tire from the rim when operated under severe overload. It is reported to be chemically inert and is unaffected by oil, water, grease, brine, and most industrial acids. Spark-proof and non-conductive, with a temperature range of from —40 to 200° F., this new tire has a wide range of industrial applications.

Goodrich Acid Hose

A new acid hose said to outlast conventional acid hose in highly corrosive service has been announced by B. F. Goodrich Industrial Products Co., Akron, O. This new hose, called Commander, contains a special hose tube made of newly developed acid-resisting material. The tube withstands 96% sulfuric acid at 70° F. as well as strong oxidizing acids and other chemicals, reports the company.

The new hose is available in two constructions for discharge and suction service. A tough, resilient rubber cover protects against scuffing. Hose can be furnished with straight ends or enlarged ends, either capped or cut-off.

New Roma Upholstery

United States Rubber Co., New York, N. Y., has introduced a new line of Elastic Naugahyde upholstery material which has the look and hand of rich brocade, yet is washable and durable. Called Roma, the new reasonably priced upholstery is being introduced in ten colors.

The vinyl upholstery is reported to have the loomed look of an individual woven fabric. It is designed to give a rich brocade, three-dimensional look. Roma has a strong, elastic jersey backing, enhancing its use for around contours. This material is 54 inches wide, 27 ounces in weight, and will be sold in 30-yard rolls through distributors and direct to large furniture manufacturers. It is made in the rubber company's Mishawaka, Ind., plant.

Advantages of Roma, according to the company, are the rich fabric look, the supple, soft feel, the controlled stretch, and washability and durability. Colors in which Roma Elastic Naugahyde are being introduced are gold, cocoa, white, antique white, flame, black, mocha, cerulean, olive, and sand.

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COLD	PHILPRENE 1500, PHILPRENE 1502, PHILPRENE 1503	PHILPRENE 1601, PHILPRENE 1605
COLD OIL	PHILPRENE 1703, PHILPRENE 1706, PHILPRENE 1708, PHILPRENE 1712	PHILPRENE 1803, PHILPRENE 1805

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European Office: Limmatquai 70, Zurich 1, Switzerland.

New Products

Goodyear Winter Tire

A new Suburbanite winter tire, redesigned and selling for less than predecessor lines, is being marketed by The Goodyear Tire & Rubber Co., Akron, O. The tire's main feature is a deep-cleated tread said to enable it to dig down through soft snow, slush, or mud at a strong driving angle for better road footage.

The stronger driving thrust of this new tire complements the high horsepower of the modern car, according to the company. During two winters of testing near Hudson Bay, Canada, the tire gave 51% better traction in deep snow and 17% better traction in mud. In other improvements, new tread compounds combined with an inter-supported tread pattern give a quieter, steadier ride on clean roads.

The new Suburbanite contains 264 Grip-Cleats, 27 of which are involved in every footprint. Flat face of the cleats gives 30 square inches of tire contact in each footprint, augmenting the tire's performance on ice or hard-packed snow.

Available in either triple-tempered 3-T nylon or rayon cord, the tire is preshaped for the road by a new manufacturing process. The tire will sell approximately 15% less than winter tires marketed by the company last year. The sizes range from 5.20-13 through 6.00-16, depending upon the construction of the tire.

Surety's Teflon Glove

Development of a new industrial glove said to be completely impervious to strong acids and solvents has been announced by the Surety Rubber Co., Carrollton, O., a leading manufacturer of rubber and synthetic rubber products.

Fabricated from Du Pont Teflon, and tested under the severest conditions, the gloves were unaffected by attacks of fuming red and white nitric acids, 100% sulfuric acids, and all strong solvents, according to the firm. These gloves are available in 12- and 16-inch styles that feature the exclusive Surety Turn Cuff for maximum protection.

Minnesota's Kapseal

Minnesota Rubber Co., Minneapolis, Minn., has been licensed by Bendix Aviation Corp., to be the sole manufacturer of the Kapseal, a Teflon boot which, when combined with a standard O-ring, is said to give outstanding performance in many sealing applications previously considered impossible. The Kapseal was developed and patented by Bendix to meet sealing requirements in applications requiring low-friction breakout and leakage control after prolonged periods of storage or inactivity, such as guided missiles. Laboratory tests indicate that the Kapseal will improve sealing performance in a wide variety of uses, especially continuously operating applications.

Controlled tests demonstrated that proper sealing, prolonged seal life, low breakout friction and the ability to perform satisfactorily after prolonged inactivity could be achieved by combining a standard O-ring with a thin, low-friction Teflon boot placed next to the frictioned surface.

The Kapseal is especially useful in hydraulic, pneumatic and fuel system equipment that operates under the following conditions: high-frequency, low amplitude, high response mechanisms; mechanisms which must operate the first time with minimum breakout friction; standby machinery which must operate freely after prolonged periods of inactivity. Other conditions include long-life equipment where dismantling for seal replacement is exceptionally costly; finger-tip control and solenoid operated mechanisms; and sealing on long-run countinuously operating mechanisms.

Some of the properties of Kapseal are as follows: thermal—the Kapseal will perform in temperatures ranging from 500 to −150° F.; chemical—it is almost universally chemically inert; frictional—it has an extremely low coefficient of friction; moisture—there is virtually no moisture absorption; and pressure—the Kapseal performs from 3,000 psi. on down to vacuum range.

TECHNICAL BOOKS

BOOK REVIEWS

"The Vanderbilt Rubber Handbook, 1958." Edited by George G. Winspear. Cloth covers, 8½ by 5½ inches, 622 pages. R. T. Vanderbilt Co., Inc., New York, N. Y. Distributed gratis to those active in the rubber industry; price to others, $15.

The 1948 edition of "The Vanderbilt Rubber Handbook" has proved of great value to the rubber industry, but the many improvements and developments in rubber technology during the last ten years have created a need of a revised edition. The 1958 edition is an almost entirely new handbook following the general form of the old one, but giving up-to-date information on the various subjects, particularly in the field of synthetic rubbers, in which so much recent progress has been made.

In addition to much useful information and data supplied by Vanderbilt, articles on both theory and practice in rubber technology have been contributed by recognized authorities in their fields. Noteworthy are the articles on the various commercial general-purpose and specialty synthetic rubbers, which include information on history, manufacture, types, properties, compounding, processing, and principal uses.

The 1958 edition has been held to nearly 100 pages less than the 1948 edition, mainly by leaving out the section on latex compounding since that subject is more adequately covered in the "Vanderbilt Latex Handbook" published in 1954. By putting the information in concise form in tables, graphs, and charts and by using pictures and diagrams effectively, a large field of information is covered adequately for handbook purposes without making the book too large for convenient use. For more exhaustive treatment of the subjects, it is necessary to consult the literature, references to which are given.

Two subjects of theoretical interest which are covered are vulcanization and aging.

Subjects on which very practical information is given include laboratory methods for chemical and physical testing of materials, identification of elastomers, antioxidants, and vulcanizing agents as well as discussions of the use of infrared and electron microscope techniques.

A brief discussion of statistical quality control methods, as applied to the rubber industry, is included.

The section on Commercial Products and Processes gives typical formulas and information on design and fabrication of a variety of products.

The section on General Information includes many convenient tables and charts such as a glossary of terms, key to rubber and synthetic compounds for automotive and aeromotive applications, and various tables of units and conversion factors.

This book will be very useful to compounders and other technical men in the rubber industry.

E. G. PARTRIDGE

"Economics of American Industry." Third Edition. By E. B. Alderfer and H. E. Michl. Cloth covers, 6½ by 9⁹⁄₁₆ inches, 720 pages. McGraw-Hill Book Co., Inc., New York, N. Y. Price $7.00.

This book endeavors to analyze the economics and structure of our major American industries.

Each industry is carefully discussed from the viewpoint of historical origins, geography, technology, competitive instincts, growth and industrial age, marketing and pricing policies, and future development.

Chapters of particular interest to rubber technologists will be: The Automobile Industry; The Chemical Industries; The Petroleum Industry; The Rubber Industry; The Man-Made-Fiber

Technical Books

Industry; The Shoe Industry: The Changing Pattern of Historical Development; and Technology: Its Course and Its Relation to Economic Progress.

The historical sketches are always interesting, and the technology sections usually accurate and reasonably complete. In the discussion on synthetic rubber, however, the new "synthetic natural rubbers" (Ameripol SN, Goodrich—Coral, Firestone—Natsyn, Goodyear), their raw materials, and their probable influence in the rubber industry were not discussed.

The importance of manufacturing to Americans and to industrial scientists and engineers cannot be better described than by the following table from Chapter 1 of this book:

PERCENTAGE OF TOTAL INCOME PRODUCED BY AGRICULTURE AND MANUFACTURING

Year	Agriculture	Manufacturing
1799	39.5	4.8
1849	31.7	12.5
1899	21.2	19.6
1929	12.7	26.2
1937	12.3	30.3
1955	6.6	30.7

We are truly a manufacturing nation; and those memories of "back home, down on the farm" are fast fading.

It is a wholesome and broadening experience for technologists and engineers once in a while to back away from their intense and restrictive activities and take a broad view of their particular industry and its relations with the whole industrial structure—and this is just the book with which to begin such a project.

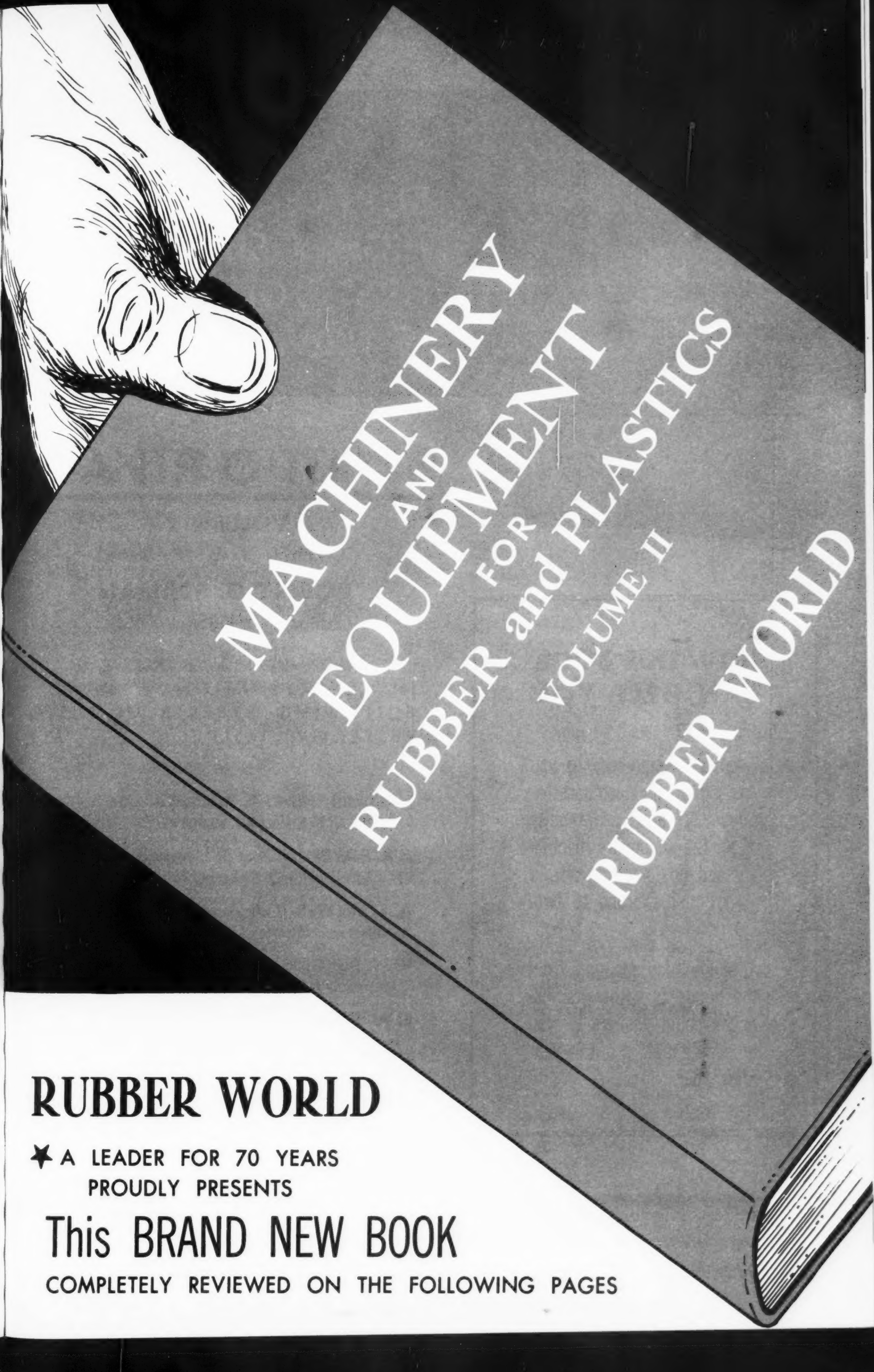
NEW PUBLICATIONS

"Sun Industrial Products." Sun Oil Co., Philadelphia, Pa. 14 pages. This new booklet gives information on the company's complete line of industrial products—general and specialty lubricants, greases, mine lubricants, diesel lubricating oils, cutting, quenching and other metal-working oils, hydraulic oils, heat-transfer oils, rubber process aids, waxes, petrochemicals, spray oils, solvents, refrigeration oils, electrical oils, and textile machine oils. A handy reply card is included for request for further information on any of the these products.

"Obtaining Low Contact and Migration Staining with Butyl Rubber." Bulletin 108. Thiokol Chemical Corp., Trenton, N. J. 8 pages. The purpose of this study was to determine the effect of accelerators and acceleration systems on the non-staining characteristics of butyl rubber compounds. An introduction, test procedure, summary, and conclusions are presented. Tables of materials tested and of the contact staining characteristics are included.

"Richardson Boss Board Control." NP-1. Richardson Scale Co., Clifton, N. J. 2 pages. The simplicity, compactness, and accuracy of a new Boss Board control system for instant formula changeover is described. The bulletin explains how the Boss Board control is used with the firm's Select-O-Weigh systems to complete the automation of batching and mixing operations.

"Silicone Rubber Gum Stocks for General and Special-Purpose Compounding." Silicones Division, Union Carbide Corp., New York, N. Y. 6 pages. Physical properties and general compounding suggestions for six silicone rubber gum stocks are given. The gums and their uses follow: W-95—for general-purpose compounds; W-96—for general-purpose and low compression set compounds; W-97—for low-temperature compounds; XW-98—for low shrink compounds; XW-950—for compounding sealants and pastes; and W-960—for high elongation compounds.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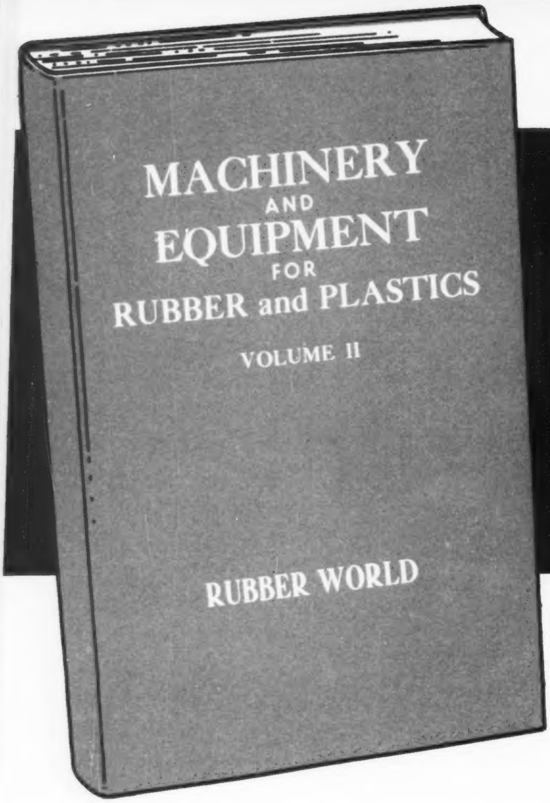

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"Mechanical Power Transmission"

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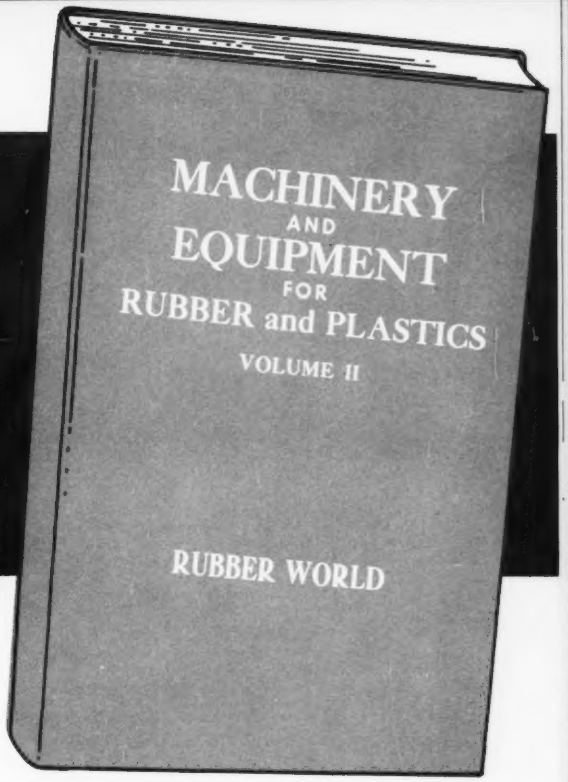

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"Size Reduction and Separation"

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"Decorative Treatments . . . Plastics"

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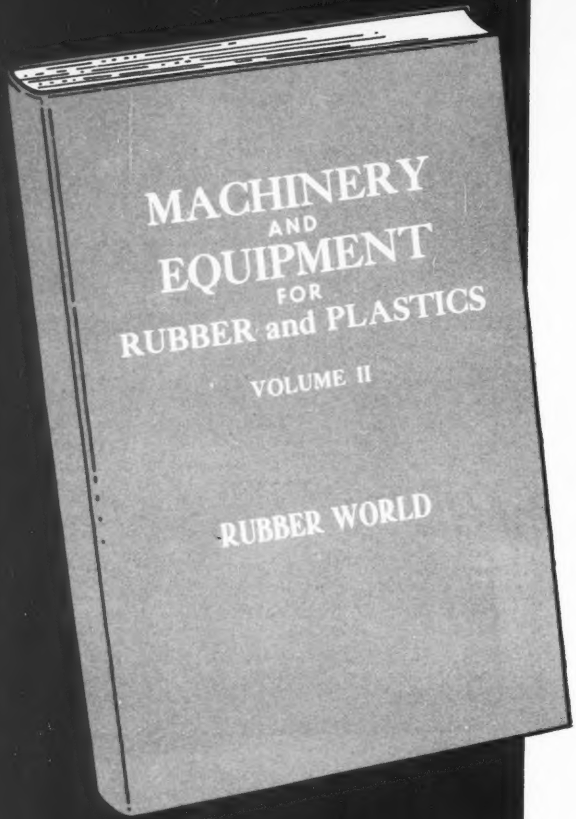

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7—Fabricating & Finishing
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9—Power Transmission
10—Lubrication
11—Steam Generation & Use.

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Each subject is fully covered and carefully indexed for ready reference. In addition to hundreds of technical experts and makers of machinery and equipment, the editor had the valued cooperation of the experts listed on previous pages.

This time and money saving book was compiled by R. G. Seaman, Editor of Rubber World.

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Technical Books

Publications of Borden Chemical Co., Polyco-monomer department, New York, N. Y:

"Polyco 345." This data sheet describes a compounded vinyl acetate homopolymer dispersion, used in wood adhesives.

"Polyco 346-LV." This data sheet treats of a polyvinyl acetate solution in methanol, used as an adhesive, surface coating, and saturant.

"Polyco 350W." A butadiene-styrene latex compatible with caseins, proteins, and starches is covered.

"Polyco 497." An alkali-soluble vinyl acetate copolymer emulsion, used in the formulation of adhesives, paper and textile coatings and sizings, and floor finishes is dealt with.

"Polyco 514W." This bulletin presents data on a vinyl acetate homopolymer solution in acetone, used in adhesives, surface coatings, and saturants.

"Polyco 684." A dextrine-compatible polyvinyl acetate emulsion, developed as a base for compounding envelope adhesives is the subject of this data sheet. Dry dextrine can be added directly into the emulsion by heating to 80° C.

"EGD Monomer." Ethylene glycol dimethacrylate, used as a crosslinking agent and as a monomer for copolymerization, is described in this data sheet.

"ISAF Black Road Tests." Part Two. J. M. Huber Corp., New York, N. Y. 8 pages. This report, subtitled "Varying Modulus Level ISAF Blacks in an Oil-Extended Polymer Passenger Tread," is a continuation of Part One, which contains the results of various modulus level ISAF blacks in a natural rubber truck tread. Part Two is a similar study with the same blacks, in an oil-extended poylmer (SBR-1712) passenger tread. The studies were conducted in an effort to secure useful data on the effect of modulus level of ISAF blacks on resistance to cracking and wear. Test conditions, tread formulation, and results are given. Physical properties secured from factory-mixed and extruded tread sections are also included.

"Hycar-Geon Blends," Manual HM-2. B. F. Goodrich Chemical Co., Cleveland, O. 21 pages. Blends of Hycar nitrile rubber with Geon polyvinyl chloride resin have found widespread application in products such as wire and cable, appliance cord, hose, molded and extruded goods, coated fabrics, food packaging, retractable telephone cord, shoe soles, etc. The rubber phase of Hycar-Geon blends serves as a plasticizer that is non-migrating and non-volatile in various plastics. Also, Geon is an excellent reinforcing pigment for Hycar. Blends containing 25% or more of vinyl resin are said to exhibit the following properties, as compared to a typical nitrile rubber compound: excellent resistance to ozone and sunlight; improved flex resistance; higher tear strength; improved flame resistance; lower tensile strength and elongation; higher compression set; excellent extrusion characteristics; excellent solvent resistance; and wide color range. The bulletin also contains comprehensive information on properties, blends, and application compounding.

"RC Plasticizers-Comonomers." Rubber Corp. of America, Hicksville, N. Y. 46 pages. This reference booklet presents the physical and chemical properties of 26 plasticizers and seven comonomers. Individual technical data pages provide specifications of these materials which include phthalates, adipates, sebacates, aliphatic acid esters, special blends, fumarates, and maleates. These are followed by nine pages devoted to performance data, application recommendations, and a description of test methods. The spiral bound volume is available from the company.

"B. F. Goodrich Oil Service Conveyor Belts." No. 2460. B. F. Goodrich Industrial Products Co., Akron, O. 2 pages. This data sheet, a guide to proper selection of oil-resistant conveyor belts, includes a comparison table which indicates the most economical belt construction for handling material which contains oil or is treated with oil. Performance of three classifications of belting—oil-resisting, oilproof, and super oilproof—are compared in services where belts are subjected to petroleum oils, cutting oils, organic solvents, cleaners, lacquer solvents, and fatty oils.

Technical Books

Publications of Copolymer Rubber & Chemical Corp., Baton Rouge, La.:

"Copo 1773." 1 page. This technical data sheet gives the general description, chemical values, physical values, and a compounding recipe of Copo 1773. This styrene-butadiene rubber is manufactured by emulsion polymerization at 41° F., using mixed rosin and fatty acid soaps and coagulated by the salt-acid procedure. It is masterbatched with 25 parts napthenic oil per 100 parts polymer. A superior non-staining stabilizer is added during manufacture. Copo 1773 is recommended for use in floor tile, shoe soles, and other products in which color stability is important.

"Carbomix 3750." 1 page. The general description, chemical and physical values, and a compounding recipe are presented for Carbomix 3750. This material is a general-purpose SBR black masterbatch which requires no dispersing agent for the carbon black. Said to have exceptionally low ash content and low water absorption, it is readily adaptable for use in tires, camelback, and molded and extruded mechanical goods.

"Carbomix 3751." 1 page. Specifications, a general description, and a compounding recipe are given for Carbomix 3751. This material is on SBR oil-extended black masterbatch which, like Carbomix 3750, is produced by the firm's unique black masterbatch process. Its applications include use in tires, camelback, molded and extruded mechanical goods.

Publications of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"Du Pont Chemicals in Butyl Rubber." BL-340. By R. W. Bell and R. J. Sievers. 12 pages. Among the company's chemicals used in butyl rubber are Thionex, Thiuram E, Thiuram M, Tetrone A, MBT, Thermoflex A, Polyac, Unicel S, Unicel ND, Neozone D, and RR-10. The compounding of these materials in a variety of butyl formulations is summarized in this bulletin. Tables and plots are included.

"Conac S." BL-341. By R. R. Radcliffe. 3 pages. This report describes Conac S, a clean, easily dispersed powder form of N-cyclohexyl-2-benzothiazole sulfenamide used as an accelerator for the delayed-action curing of SBR, NBR, and natural rubber. Physical property data on Conac S and a test recipe using this material are given.

"ASTM Standards on Rubber Products (With Related Information)." American Society for Testing Materials, Philadelphia, Pa. 908 pages, paper cover, 6 by 9 inches, $8.50. This 1958 edition, compiled by ASTM Committee D-11 on Rubber and Rubber-Like Materials, comprises all ASTM standards and methods of test and specifications pertaining to these products. There are 145 standards, of which 61 are new, revised, or have had their status recently changed. Sixteen standards not previously included in the 1957 edition have been added. Many of these pertain to carbon black and synthetic rubbers and elastomers. Among the general subjects covered are: processibility tests, inter-laboratory tests, chemical tests of vulcanized rubber, physical tests of vulcanized rubber, aging and weathering tests of rubber, low-temperature tests of rubber, automotive and aeronautical rubber, packing and gasket materials, hose and belting, tape, electrical protective equipment, rubber-coated fabrics, insulated wire and cable, hard rubber, rubber adhesives, crude rubber, rubber latex, synthetic elastomers, compounding materials, non-rigid plastics, electrical tests, nomenclature and definitions, and general tests methods. Copies may be obtained from ASTM headquarters.

"Sodium Borohydride-Potassium Borohydride." Metal Hydrides, Inc., Beverly, Mass. 34 pages. This new manual of techniques covering the properties, reactions and handling requirements of sodium and potassium borohydrides includes detailed discussions of reactions in aqueous and nonaqueous solvents. Technical data compiled from the most significant works published to date is presented in 13 convenient tables. The compounds are used in the pulp and paper, pharmaceutical, chemical, rubber, plastics and allied industries.

Publications of Harwick Standard Chemical Co., Akron, O.:

"Metasap 597." Bulletin #P-09-28-2-5-58. 2 pages. This data sheet describes Metasap 597, a gelling agent for aliphatic and aromatic hydrocarbons manufactured by Metasap Chemical Co., Harrison, N. J., and distributed by Harwick. Metasap 597 is a preferred grade of aluminum octoate in the form of a fine white powder. It has an excellent thickening effect on hydrocarbons such as coal-tar solvents, turpentine, gasoline, naphtha, Stoddard solvent, mineral spirits, and kerosene. Preparation of gels and behavior of Metasap 597 in various solvents is presented.

"Ahcolein 810." Bulletin #P-16-154-1-7-58. 1 page. This data sheet deals with Ahcolein 810, a double-distilled type of red oil manufactured by Arnold, Hoffman & Co., Inc., Providence, R. I., and distributed by Harwick. The material is a clear, pale-yellow color, high in oleic acid content. It may be used in the production of synthetic rubber, plasticizers, and many other products. Specifications are given in the data sheet.

"Thixon NM Rubber-to-Metal Bonding Adhesive." #03-121-5-8-58. 2 pages. This technical data sheet describes Thixon NM, an adhesive for the vulcanization bonding of neoprene stock to steel and other metals manufactured by Dayton Chemical Products Laboratories, Inc. Included in the data sheet are Thixon NM's function, composition, properties, consistency, application, and usage data.

"World's Fastest Wire Cutting and Stripping Machine." Jennings Machine Corp., Philadelphia, Pa. 4 pages. This two-color bulletin describes a new completely automatic, high-speed machine, called the Acme wire cutter and stripper. A table gives specific information on production rates (up to 9,000 pieces per hour) *versus* wire lengths (up to 120 inches). Tolerances, types of insulated wire handled, and operating features are also covered. Copies of this bulletin are available without charge from the company.

"Foreign Licensing—Questions and Answers." Pegasus International Corp., New York, N. Y. 12 pages. This booklet is designed to help the business executive gain a working knowledge of the problems for foreign licensing, and to serve as a guide in avoiding its pitfalls. In question-and-answer form, the booklet presents the advantages and disadvantages of licensing: it goes into such practical problems as selecting the proper partner, the importance of securing patents, setting royalty fees and collecting these in dollars, evaluating potential markets, and similar topics.

"Standards of the Expansion Joint Manufacturers Association." Expansion Joint Manufacturers Association, New York, N. Y. 32 pages. This edition contains up-to-date information concerning the design, construction, application, and testing of expansion joints for piping and other services. Much of this information, having never been published before, will be of value to manufacturers, contractors, engineers, and government officials who specify and purchase expansion joints of the types covered. The format of the first edition is 8½ by 11 inches, with semi-flexible simulated leather cover. Copies of this new edition are available at $1.00 postpaid by forwarding check to George P. Byrne, Jr., secretary, Expansion Joint Manufacturers Association, 53 Park Place, New York 7, N. Y.

"Cellular PVC." Rubatex Products, Inc., New York, N. Y. 3 pages. This newsletter contains a résumé on the various details of the manufacture of closed-cell polyvinyl chloride. Topics covered include mixing, molding, cooling, and formulation. Patents are also listed.

"High-Temperature-Resistant Sealant Materials." Order PB 131478. L. C. Boller *et al.* Coast Pro-Seal & Mfg. Co., for WADC, U. S. Air Force. 26 pages. 75¢. A formula was developed for an aircraft fuel tank sealant unaffected by JP-5 jet fuel in the 600 to 625° F. range. A thorough study was also made of the butadiene-acrylonitrile rubber and phenolic resin system to develop the optimum thermal stability potential. The effect of added antioxidants, leafing pigments, plasticizers, and other materials was determined. The liquid polybutadiene modifications and several other coating systems were also evaluated.

MARKET REVIEWS

Natural Rubber

During the September 16-October 15 period New York has repeatedly reported good buying by factories, undoubtedly prompted by the settlements of the labor disputes in the automobile industry. There has been some spasmodic hesitancy, however, owing to local strikes and apparent difficulties in getting car production into full swing.

In general, the natural rubber market has been extremely steady. Offerings of physical rubber in primary have been light; it appears likely, however, that crude consumption this year will outstrip crude production. Good manufacturer demand for actuals continues to be a principal factor in the strength of this market. Two encouraging signs have developed: (1) new cars are already receiving excellent acceptance, and (2) new pacts with the automobile industry insures three-year labor peace. Also, one source has stated that despite the recession this year will be the best year yet for replacement tires.

September sales, on the New York Commodity Exchange, amounted to 7,680 tons, compared with 6,290 tons for August contract. There were 21 trading days in September and 21 during the September 16-October 15 period.

REX CONTRACT

1958	Sept. 19	Sept. 26	Oct. 3	Oct. 10
Sept.	30.00	30.25	....	....
Nov.	29.35	29.60	30.40	30.60
1959				
Jan.	29.10	29.50	30.10	30.35
Mar.	29.05	29.40	29.90	30.25
May	29.00	29.40	29.80	30.20
July	28.90	29.30	29.75	30.20
Sept.	28.85	29.25	29.70	30.15
Nov.	....	....	29.65	30.15

NEW YORK OUTSIDE MARKET

	Sept. 19	Sept. 26	Oct. 3	Oct. 10
RSS #1	29.63	30.00	30.50	30.75
#2	29.25	29.63	30.00	30.25
#3	28.13	28.50	29.50	29.63
Pale Crepe				
#1 Thick	31.88	32.13	32.38	32.63
Thin	32.13	32.38	33.38	33.63
#3 Amber Blankets	24.00	24.25	25.13	25.75
Thin Brown Crepe	23.50	23.88	24.75	25.38
Standard Bark Flat	19.65	19.75	20.25	20.63

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 30.21¢ per pound for the September 16-October 15 period. Average September sellers' prices for representative grades were: RSS #3, 27.74¢; #3 Amber Blankets, 23.37¢; and Flat Bark, 19.52¢.

Synthetic Rubber

Continuing evidence of the business upturn in the rubber industry is found in the new rubber consumption figures for September, as released by the Rubber Manufacturers Association, Inc. September consumption at 123,875 long tons of natural and synthetic rubber is the best month this year. Consumption of all types of synthetic rubber at 78,816 tons, as compared with August's 71,762, makes September the highest synthetic rubber consumption month of 1958, even though the synthetic rubber percentage of total was 63.6% as compared with 64.5% in August. Continuing consumption at the September or even higher levels is expected for the remainder of this year and into 1959.

Consumption by types of synthetic rubber in September, as compared to August figures, was as follows: SBR, 65,147 tons, against 49,458; neoprene, 6,509, against 5,1719; butyl, 4,659 against 4,277; and nitrile, 2,501, against 2,308. Increases in production were registered for all types except butyl, and total stocks were reduced for all except SBR.

Development trends continue in the direction of light-colored, non-staining varieties of SBR and improved black and oil-black masterbatches. It is in this connection that market information on these new grades leaves something to be desired. Standard commercial grades are listed, and the list is kept up to date by the American Society for Testing Materials in its D-11 Rubber Committee's ASTM D 1419-58T and D 1420-58T, but semi-commercial grades for which appropriate numbers are available from ASTM are not so listed by ASTM, nor are they furnished the trade journals for publication. There are about 50 standard commercial grades, but at present there are also 50 semi-commercial grades which are not adequately described in ASTM publications or the rubber trade journals, as to number, composition or price. It would seem to be to the SBR producers advantage to take steps to improve this situation.

Exports of synthetic rubber rose to 14,185 tons in September, as compared with 12,654 in August.

Latex

During the September 16-October 15 period, slightly better interest in latex was noted, and moderate offtake was reported. However, as the supply position for nearby shipment still is remaining heavy, there has been no real improvement in the price differential between dry rubber and latex rubber.

The immediate outlook is not too promising, but if the trend here continues and reports regarding curtailment of latex production are confirmed, more healthy conditions in the latex market in general could be created, though the process may be slow to develop.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 37.54¢ per pound solids. Synthetic latices prices were 21.5 to 38.2¢ for SBR; 37 to 53¢ for neoprene; and 46 to 60¢ per pound for the nitrile types.

Final July and preliminary August domestic statistics for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
July	0	*	4,531	15,516
Aug.	0	*	6,094	13,750
SBR				
July	3,645	—	3,433	6,693
Aug.	4,654	—	4,654	7,166
Neoprene				
July	677	0	629	1,312
Aug.	892	0	764	1,195
Nitrile				
July	893	0	703	1,990
Aug.	1,103	0	1,025	2,049

*Not available yet for period covered.

Scrap Rubber

During the September 16-October 15 period the scrap rubber market was described as about holding its own, with activity at about the same improved level it has shown in recent weeks. Mills were taking in scrap, but, trade factors pointed out, there is still a good deal of room for improvement in the market. Synthetic butyl tubes were quoted at 3.50¢ a pound at eastern points, and at 4.00¢ in the Midwest.

Interest in the trade recently was centered on the meeting of the National Association of Waste Material Dealers' Scrap Rubber and Plastics In-

NO. 19 OF A SERIES Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

ANTIOXIDANT 2246®

...Scores High in Both Performance and Economy

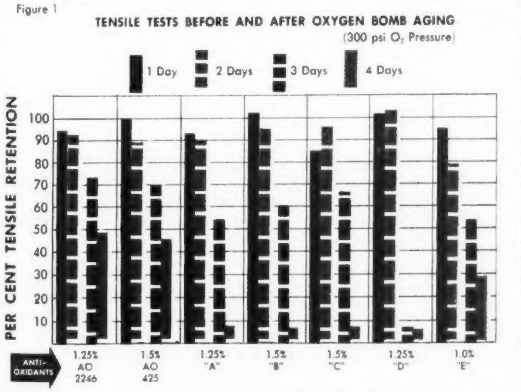
The standard of excellence for non-staining rubber antioxidants has long been Cyanamid's Antioxidant 2246. Compounders who make thorough comparative studies of available materials usually find it unmatched for maximum protection of top-quality rubber goods, regardless of price. In this respect, Antioxidant 2246 is exhibiting only one of its major advantages, which include:

(1) Superior protection even under extreme aging conditions.

(2) Economy when used in the lower concentrations that give protection equivalent to other antioxidants.

In Figure 1, the effectiveness of Antioxidant 2246 under severe aging conditions is compared with the effectiveness of other commercially available non-staining antioxidants. Included in this group is Cyanamid's Antioxidant 425®, the analogue of Antioxidant 2246, and the product recommended for use where even the slightest discoloration cannot be tolerated. Aging is measured as the per cent retention of tensile strength after various periods in an oxygen bomb at 80°C and 300 psi oxygen pressure.

Figure 1

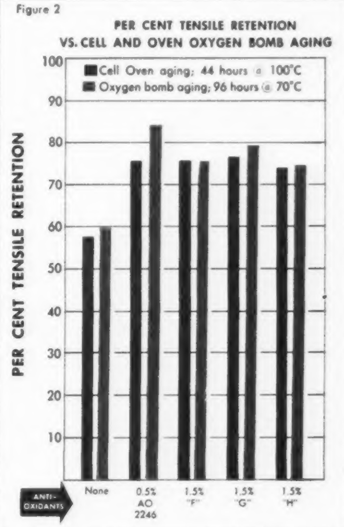


One or two days under these conditions reveal only slight differences in tensile strength retention. Even after five days, Antioxidant 2246, while measurably superior to several others, still does not represent a clear-cut choice. After ten days exposure, however, Antioxidant 2246 and Antioxidant 425 demonstrate their superiority in unmistakable fashion. Where the ultimate in protection is demanded, the choice is clear... Antioxidant 2246 for best all-round color and aging protection; Antioxidant 425 for the absolute minimum of discoloration. Stringent though it is, this test is a practical reflection of temperature and atmospheric exposure extremes found in many of today's rubber applications. Manufacturers of high-quality products which face such severe conditions can safely depend on these two outstanding Cyanamid rubber chemicals.

In many applications, however, price tags are important and economy may be the over-riding consideration. Here compounders may be attracted to antioxidants with the lowest prices. Unless conducted under severe conditions, tests on an equal weight-of-protectant basis may sometimes appear to confirm the choice, showing Antioxidant 2246 to be only slightly superior to the cheaper products. The compounder may well wonder if the extra margin of protection is worth the higher cost. But the true cost to be considered in such cases is the cost of the finished compound, not the purchase price of the ingredients.

Where economy is the controlling factor

Figure 2



in meeting given specifications, the minimum amount of a particular antioxidant needed to meet the aging requirements is usually determined. Other antioxidants should then be evaluated on the basis of obtaining either the best performance at same cost – or lowest cost for the same performance. Such a comparison is shown in Figure 2 where 0.5% of Antioxidant 2246 is compared with triple that concentration of three products selling in the 55 to 60 cent range. At this greatly reduced dosage, Antioxidant affords protection fully equivalent to the competitive products *and the compounder benefits from a reduced compounding cost!*

Both in ultimate protection performance and cost, therefore, Antioxidant 2246 scores outstandingly. Technical information relevant to your own applications may be obtained from your Cyanamid Rubber Chemicals representative, or direct from American Cyanamid Company, Rubber Chemicals Department, Bound Brook, N. J.

stitute, which met on October 10, at the NAWMD convention in Atlantic City. Current trade problems were on the meeting's agenda.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.75	2.75
Black	5.75	5.75
Red	6.25	6.25
Butyl	3.50	4.00

Reclaimed Rubber

The period between September 16-October 15 was reported to have been very good in the reclaim market. September was a very good month, according to one source, and October was expected to be even better as the automotive industry went into full swing.

According to another source, business in general is on the upswing, and this is true in the reclaiming industry. How stable this increase remains depends largely on the production of 1959 automobiles.

Reclaimed rubber prices were unchanged during this period.

According to The Rubber Manufacturers Association, Inc., report, September production of reclaimed rubber reached 22,800 tons; while consumption was 22,900 long tons.

Reclaimed Rubber Prices

Whole tire, first line	$0.11
Third line	.1025
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Industrial Fabrics

Trading in wide industrial fabrics has become very active again, it is reported. Vinyl plastic coaters have come into the market to purchase substantial yardages of these goods for delivery extending through the year.

A brief lull developed in wide industrial goods after mills advanced prices ½¢ a yard on September 19 right on the heels of the Ford Motor Co.-United Auto Workers (AFL-CIO) settlement. But toward the close of the period under review a big revival of buying took place, with plastic coaters reported to be buying for auto interior end-uses.

The renewal of forward buying in wide fabrics for plastic coating also accompanied price advances in Army ducks of 1¢ a pound.

In wide coating fabrics, buying was active across-the-board, a market check indicates, with orders placed on wide drills, broken twills, sheeting and sateens for delivery in October, November, and December.

Industrial Fabrics

Broken Twills*		
54-inch, 1.14, 76x52	yd.	$0.52
58-inch, 1.06, 76x52		.565
60-inch, 1.02, 76x52		.5825
Drills*		
59-inch, 1.85, 68x40	yd.	.35
2.25, 68x40		.2975
Osnaburgs*		
40-inch, 2.11, 35x25	yd.	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.26
62-inch, 2.23, 32x26		.275

Ducks

Enameling Ducks*	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.28
51.5-inch, 1.35 yd.	.4588	.46
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Army Duck†		
52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.)	yd.	.5925
Numbered Duck†		
List less 45%		
Hose and Belting Duck*		
Basis	lb.	.63
Sheeting*		
40-inch, 3.15, 64x64	yd.	.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.2275
57-inch, 3.47, 48x48		.235
60-inch, 2.10, 64x64		.36
2.40, 56x56		.31
Sateens*		
53-inch, 1.12, 96x60	yd.	.565
1.32, 96x64		.52
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.625
1.21, 96x64		.5725
Chafer Fabrics*		
14.40-oz./sq.yd. P.Y.	yd.	.73
11.65-oz./sq.yd. S.Y.		.61
10.80-oz./sq.yd. S.Y.		.6575
8.9-oz./sq.yd. S.Y.		.67
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

*Net 10 days.
†2% 10 days.

Rayon and Nylon

In a recent study by a major tire cord manufacturer, comparing the first half of 1957 with the first half of 1958, use of nylon tire cord and fabric showed an increase of 8.2% this year; while use of rayon tire cord and fabric for the same period was off 29.6%.

Consumption figures are arrived at by combining production of tire cord and tire cord fabric with changes in inventories held by major tire and tire cord manufacturers. All figures are derived from quarterly reports made by the Bureau of the Census of the United States Department of Commerce.

In the first half of 1957, nylon tire cord and fabric usage amounted to 38,966,000 pounds, growing to 42,166,000 pounds in the first half of 1958, an increase of 8.2%. Use of rayon tire cord and fabric in the first half of 1957 totaled 165,115,000 pounds, but dropped off to 116,115,000 pounds for the first half of 1958, a decline of 29.6%.

Total packaged production of rayon and acetate filament yarn during September was 56,400,000 pounds consisting of 23,100,000 pounds of high-tenacity rayon yarn and 33,300,000 pounds of regular-tenacity rayon yarn. For August production had been: total, 53,600,000 pounds, including regular-tenacity rayon yarn, 32,800,000 pounds; high-tenacity rayon yarn, 20,800,000 pounds.

Filament yarn shipments to domestic consumers for September totaled 55,200,000 pounds, of which 23,200,000 pounds were high-tenacity rayon yarn and 32,000,000 pounds were regular-tenacity rayon yarn. August shipments had been: total, 56,500,000 pounds; high-tenacity, 21,900,000 pounds; regular-tenacity, 34,600,000 pounds.

Stocks on September 30 totaled 60,600,000 pounds, made up of 13,500,000 pounds of high-tenacity rayon yarn and 47,100,000 pounds of regular-tenacity rayon yarn. End-of-August stock had been: total, 61,300,000 pounds; high-tenacity rayon yarn, 14,900,000 pounds; regular-tenacity yarn, 46,400,000 pounds.

Rayon Prices

Tire Fabrics	
1100/490/2	$0.71 /$0.75
1650/908/2	.63 / .725
2200/980/2	.625/ .655
Tire Yarns	
High-Tenacity	
1100/ 490, 980	.50/ .64
1100/ 490	.59/ .63
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.665
1900/ 720	.58

Nylon Prices

Tire Yarns	
840/ 140	$1.10/$1.20
1680/ 280	1.20

Handy Guide TO EVALUATION OF BASE FABRICS

FIBER CONTENT		
WEAVE		
WEIGHT		
THREAD COUNT		
YARN NUMBERS		
TWIST		
CRIMP		
GAUGE		
BREAKING STRENGTH		
TEARING STRENGTH		
BURSTING STRENGTH		
ABRASION RESISTANCE		
FLEX RESISTANCE		
SURFACE CHARACTERISTICS		
COVER		
FLEXIBILITY		
DIMENSIONAL STABILITY		
STRIKE-THROUGH		
ADHESION		
MOISTURE REGAIN		
CHEMICAL COMPATIBILITY		
CHEMICAL RESISTANCE		
HEAT RESISTANCE		
ULTRA VIOLET RESISTANCE		
FLAME RESISTANCE		
CONTINUOUS AVAILABILITY OF FABRIC IN RIGHT WIDTHS, WEIGHTS, GAUGES, CONSTRUCTIONS.		

This fictitious "guide" has been created solely to show some of the factors which often have to be considered in the selection of a base fabric. They serve only to point up one fact: that there can be *no* such thing as a put-it-in-your-pocket guide in this field. But one thing is certain: when you're guided by Wellington Sears, you know that your base fabric has been considered in the light of your specific need, and that all significant technical factors have been thoroughly examined. This thoroughness, plus more than a century of experience, is available to help solve *your* working-fabric problems. For free booklet, "Fabrics Plus," write Dept. H-11.

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For Mechanical Goods, Coated Materials, Tires, Footwear and Other Rubber Products

WELLINGTON SEARS COMPANY, 111 West 40th St., New York 18, N. Y. • Atlanta • Boston Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

WEST POINT TEXTILES ®

Compounding Ingredients*

Abrasives

Pumicestone, powdered	lb.	$0.0363	$0.065
Rottenstone, domestic	lb.	.03	.04
Shelblast	ton	80.00	165.00
Walnut Shell Grits	ton	50.00	160.00

Accelerators

A-1 (Thiocarbanilide)	ton	.50	.57
A-32	ton	.66	.80
A-100	lb.	.52	.66
Accelerator 49		.59	.60
52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	4.25	
89	lb.	1.20	
108	lb.	.92	.97
552	lb.	2.25	
808	lb.	.66	.68
833	lb.	1.17	1.19
Altax	lb.	.54	.56
Arazate	lb.	2.25	2.30
Beutene	lb.	.66	.71
Bismate	lb.	3.00	
B-J-F	lb.	.27	.32
Butasan	lb.	1.04	
Butazate	lb.	1.04	1.09
Butyl Accelerator Eight	lb.	1.35	
Namate	lb.	.45	.50
Zimate	lb.	1.04	
Ziram	lb.	.89	1.04
Captax	lb.	.44	.46
Conac S	lb.	.76	.78
C-P-B	lb.	1.95	2.00
Cumate	lb.	1.45	
Cydac	lb.	.76	.78
Dibs	lb.	.85	
Dipac	lb.	.85	
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.69	.70
Du Pont	lb.	.69	.70
DPG (diphenylguanidine)			
Cyanamid	lb.	.49	.50
Monsanto	lb.	.52	.58
El-Sixty	lb.	.62	.64
Ethasan	lb.	1.04	
Ethazate	lb.	1.04	1.09
50-D	lb.	.87	.92
Ethyl Seleram	lb.	3.00	
Thiurad	lb.	1.04	
Thiram	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04	1.09
Zimate	lb.	1.04	
Ziram	lb.	.89	1.04
Ethylac #650	lb.	.93	.95
Guantal	lb.	.60	.67
Hepteen	lb.	.44	.50
Base	lb.	1.85	1.90
Ledate	lb.	1.04	
MBT (2-mercaptobenzothiazole)			
American Cyanamid	lb.	.44	.46
Du Pont	lb.	.44	.46
Naugatuck	lb.	.44	.49
-XXX, Cyanamid	lb.	.55	.57
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.54	.56
Du Pont	lb.	.54	.56
Naugatuck	lb.	.54	.59
-W Cyanamid	lb.	.59	.61
Merac #225	lb.	.75	1.05
Mertax	lb.	.55	.57
Methasan	lb.	1.04	
Methazate	lb.	1.04	1.09
Methyl Thiram	lb.	1.14	
Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14	1.19
Mono-Thiurad	lb.	1.14	
2-MT (2-mercaptothiazoline)			
Cynamid	lb.	.88	.90
Du Pont	lb.	1.00	
NOBS No. 1	lb.	.76	.78
Special	lb.	.80	.82
O-X-A-F	lb.	.55	.60
Pennac SDB	lb.	.45	.48
Pentex	lb.	1.24	1.29
Flour	lb.	.30	.35
Permalux		2.25	
Phenex	lb.	.52	59
Pip-Pip		2.07	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.55	.57
RZ-50, -50B	lb.	1.00	
S. A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	3.00	
Santocure	lb.	.76	.78
NS	lb.	.80	.82
Selenacs	lb.	3.00	
SPDX-GH	lb.	.69	.74
GL	lb.	1.20	1.34
Sulfads	lb.	1.98	
Tellurac	lb.	1.30	1.55
Tepidone	lb.	.45	.45
Tetrone A	lb.	1.98	
Thiates	lb.	.88	1.25
Thiofide	lb.	.54	.56
S	lb.	.64	.66
Thionex	lb.	1.14	
Thiotax	lb.	.44	.46
Thiurad	lb.	1.14	
Thiuram E	lb.	$1.04	
M	lb.	1.14	
Trimene	lb.	.56	.62
Base	lb.	1.03	1.10
Tuex	lb.	1.14	
Ultex	lb.	1.00	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66	.73
Vulcacure NB	lb.	.45	
NS	lb.	.75	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85	.89
Z-B-X	lb.	2.45	2.50
Zenite	lb.	.54	.56
A	lb.	.69	.71
Special	lb.	.55	.57
Zetax	lb.	.51	.53
Zimate	lb.	1.04	

Accelerator-Activators, Inorganic

Lime, hydrated	ton	21.96	
Litharge, comml.	lb.	.1525	.1575
Eagle, sublimed	lb.	.1535	
National Lead, sublimed	lb.	.1585	
Red lead, comml.	lb.	.185	.195
Eagle	lb.	.1575	
National Lead	lb.	.1625	
PRD-90	lb.	.38	.50
White lead, carbonate	lb.	.19	.20
Eagle	lb.	.1775	.1875
National Lead	lb.	.175	.185
Silicate	lb.	.1725	.1825
Eagle	lb.	.1625	.1725
National Lead	lb.	.1625	.1725
Zinc oxide, comml.†	lb.	.145	.1925

Accelerator-Activators, Organic

Aktone	lb.	.2125	.2325
Barak	lb.	.65	
Capital 170	lb.	.20	.25
171	lb.	.1425	.1925
255, 258, 710	lb.	.14	.19
270	lb.	.1175	.1425
261	lb.	.155	.18
262	lb.	.16	.185
263	lb.	.1775	.2025
Curade	lb.	.57	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1425	.1925
G-M-F	lb.	2.60	2.65
PDD-70	lb.	2.70	3.00
PGD-25	lb.	1.25	1.50
Groco 30	lb.	.1425	.1925
35	lb.	.1475	.1975
Guantal	lb.	.62	.64
Hyfac 410	lb.	.15	.175
430	lb.	.18	.205
431	lb.	.2025	.2275
Hystrene S-97	lb.	.1863	.2125
T 45	lb.	.1638	.19
T-70	lb.	.1738	.20
Industrene B	lb.	.1263	.1525
R	lb.	.1138	.14
158	lb.	.1313	.1575
254	lb.	.1413	.1675
262	lb.	.1513	.1775
Laurex	lb.	.34	.38
MODX	lb.	.295	.345
NA-22	lb.	1.00	
PND-70	lb.	1.35	1.60
Oleic acid, comml.	lb.	.185	.225
Emersol 210 Elaine	lb.	.145	.195
Groco 2, 4, 8, 18	lb.	.14	.19
Welcoline	lb.	.21	.42
Plastone	lb.	.27	.30
Polyac	lb.	1.85	
Ridacto	lb.	.25	.26
Seedine	lb.	.1485	.1703
Stearex Beads	lb.	.1488	.1588
Stearic acid			
Emersol 120	lb.	.165	.19
150		.1925	.2175
Hydrofoil 51	lb.	.09	
Hydrogenated, rubber grd.			
Groco 56	lb.	.1175	.1425
Rufat 75	lb.	.1062	.1325
Single pressed, comml.	lb.	.1475	.1675
Emersol 110	lb.	.16	.185
Groco 53	lb.	.155	.18
Wilmar 253	lb.	.1525	.1775
Double pressed, comml.	lb.	.1525	.1725
Groco 54	lb.	.16	.185
Wilmar 254	lb.	.1575	.1825
Triple pressed, comml.	lb.	.175	.195
Groco 55	lb.	.1775	.2025
Wilmar 255	lb.	.1875	.2125
Sterene 60-R	lb.	.09	.1075
Tonox	lb.	.515	.605
Vimbra	lb.	.32	.385
Vulklor	lb.	.88	1.08
Wilmar 110	lb.	.17	.22
434	lb.	.1425	.1925
Zinc stearate, comml.	lb.	.39	.44

Antioxidants

AC-1	lb.	.37	.86
-5	lb.	1.49	1.63
AgeRite Alba	lb.	$2.40	$2.50
Gel	lb.	.70	.72
H. P.	lb.	.79	.81
Hipar	lb.	1.05	1.07
Powder	lb.	.57	.59
Age Resin	lb.	.88	.90
D	lb.	.57	.59
Spar	lb.	.57	.59
Stalite	lb.	.57	.59
S	lb.	.57	.59
Superlite	lb.	.57	.59
White	lb.	1.50	1.60
Akroflex C	lb.	.85	.87
CD	lb.	.79	.81
Albasan	lb.	.69	.73
Alcogard 354 Powder	lb.	1.50	1.52
Allied AA 1144	lb.	.23	.24
AA-1177	lb.	.155	.165
Aminox	lb.	.57	.62
Antioxidant 425	lb.	2.47	2.50
2246	lb.	1.50	1.53
Antisol	lb.	.23	.24
Antisun	lb.	.15	.51
Antox	lb.	.59	.61
Aranox	lb.	3.25	3.30
Betanox Special	lb.	.91	.96
B-L-E, -25	lb.	.57	.62
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.55	.60
Catalin AC-5	lb.	1.49	1.63
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91	1.16
Deenax	lb.	.95	
Flectol H	lb.	.57	.59
Flexamine	lb.	.79	.84
Heliozone	lb.	.31	.32
Ionol	lb.	.91	1.65
Microflake	lb.	.20	.24
Naugawhite	lb.	.57	.62
NBC	lb.	1.55	
Neozone A	lb.	.64	.66
C	lb.	.86	.88
D	lb.	.57	.59
Nevastain A	lb.	.51	.61
B	lb.	.51	.70
Octamine	lb.	.57	.62
PDA-10	lb.	.46	.48
Perflectol	lb.	.61	.68
Permalux	lb.	2.25	
Polygard	lb.	.57	.62
Polylite	lb.	.55	.60
Protector	lb.	.26	.31
Rio Resin	lb.	.60	.62
Santoflex 35	lb.	.72	.79
75	lb.	1.01	1.03
AW	lb.	.71	.78
B	lb.	.52	.59
BX	lb.	.63	.70
DD	lb.	.57	.59
Santovar A	lb.	1.55	1.57
Santowhite Crystals, Powder	lb.	1.55	1.62
L	lb.	.57	.59
MK	lb.	1.25	1.32
Stabilite	lb.	.55	.59
Alba	lb.	.72	.79
L	lb.	.60	.64
White	lb.	.52	.60
Powder	lb.	.41	.47
Styphen I	lb.	.51	.55
Sunolite #100	lb.	.21	.23
#127	lb.	.17	.19
Sunproof-713	lb.	.26	.31
Improved	lb.	.25	.30
Jr.	lb.	.22	.27
Tenamene 3	lb.	.91	1.05
Thermoflex	lb.	1.05	1.07
Tonox	lb.	.54	.59
Tysonite	lb.	.24	.2475
Velvapex 51-250	lb.	.40	
V-G-B	lb.	.75	.80
Wing-Stay S, T	lb.	.55	.67
100	lb.	1.00	1.08
Zalba	lb.	1.10	
Zenite	lb.	.52	.54

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

Antiozonants

Eastozone 30, 31	lb.	1.05	1.09
32	lb.	1.70	1.72
Tenamene 30, 31	lb.	1.24	1.28
UOP 88, 288	lb.	1.05	1.07

Antiseptics

Copper naphthenate, 6-8%	lb.	.245	
Pentachlorophenol	lb.	.22	.30
Resorcinol, technical	lb.	.775	.785
Zinc naphthenate, 8-10%	lb.	.245	.30

Blowing Agents

Ammonium bicarbonate	lb.	.07	.09
Carbonate	lb.	.16	
Blowing Agent CP 1475	lb.	.32	.35
Celogen	lb.	1.95	2.00
50 C	lb.	1.01	1.07
Kempore R-125	lb.	1.95	
Opex 40	lb.	.76	
Sodium bicarbonate	100 lbs.	2.55	3.85
Carbonate, tech.	100 lbs.	1.35	5.52
Sponge Paste	lb.	.20	
Unicel ND	lb.	.76	
NDX	lb.	1.52	
S	lb.	.20	

Bonding Agents

Braze	gal.	6.00	9.00
Cover cement	gal.	2.50	4.00
Chemlok 201, 203	gal.	5.00	7.50
220	gal.	9.25	12.00
401	gal.	11.70	14.40

Chemlok 602	gal.	$25.00	$26.00
607	gal.	18.00	
614	lb.	4.35	4.75
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52	5.10
SS-64	lb.	3.65	6.75
-67 Primer	lb.	7.50	12.50
Gen-Tac Latex	lb.	.70	.805
Hylene M	gal.	3.50	3.75
M-50	gal.	1.90	2.15
Kalabond Adhesive	gal.	6.50	16.00
Tie Cement	gal.	2.00	5.60
Thixons	gal.	1.48	12.00
Ty Ply, BN, Q, S, UP, 3640	gal.	6.75	8.00
RC	gal.	3.75	5.00

Brake Lining Saturants

BRT 3	lb.	.018	.0265
Resinex L-S	lb.	.0225	.03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.23	.30
Kosmos/Dixie BB	lb.	.23	.30
Spheron C	lb.	.18	.24
Voltex	lb.	.18	.315

Easy Processing Channel—EPC

Collocarb EPC	lb.	.059	.099
Continental AA	lb.	.074	.1225
Kosmobile 77/Dixiedensed 77	lb.	.074	.1225
Micronex W-6	lb.	.0725	.145
Spheron #9	lb.	.0775	.145
Texas E	lb.	.0775	.145
Witco #12	lb.	.074	.1225
Wyex EPC	lb.	.0775	.135

Hard Processing Channel—HPC

Continental F	lb.	.074	.1225
HX HPC	lb.	.074	.1225
Kosmobile S/Dixiedensed S	lb.	.074	.1225
Micronex Mk. II	lb.	.0775	.145
Witco #6	lb.	.074	.1225

Medium Processing Channel—MPC

Arrow MPC	lb.	.0775	.135
Continental A	lb.	.074	.1225
Kosmobile S-66/Dixiedensed S-66	lb.	.0775	.145
Micronex Standard	lb.	.0725	.145
Spheron #6	lb.	.0775	.145
Texas 109	lb.	.084	.1475
M	lb.	.0775	.145
Witco #1	lb.	.074	.1225

Conductive Furnace—CF

Aromex CF	lb.	.0875	.145
Vulcan C	lb.	.110	.175
SC	lb.	.18	.245
XC-72	lb.	.25	.33

Fast Extruding Furnace—FEF

Arovel FEF	lb.	.0675	.125
Continex FEF	lb.	.06	.10
Kosmos 50/Dixie 50	lb.	.06	.10
Philblack A	lb.	.0675	.115
Statex M	lb.	.0625	.125
Sterling SO	lb.	.0675	.125

Fine Furnace—FF

Statex B	lb.	.0675	.13
Sterling 99	lb.	.0725	.13

High Abrasion Furnace—HAF

Aromex HAF	lb.	.0775	.135
Continex HAF	lb.	.079	.125
Kosmos 60/Dixie 60	lb.	.079	.1175
Philblack O	lb.	.0775	.125
Statex R	lb.	.0725	.135
Vulcan #3	lb.	.0775	.135

Intermediate Super Abrasion Furnace—ISAF

Aromex ISAF	lb.	.0925	.15
Kosmos 70/Dixie 70	lb.	.10	.145
Philblack I	lb.	.0925	.14
Statex 125	lb.	.0875	.15
Vulcan 6	lb.	.0925	.15

Super Abrasion Furnace—SAF

Philblack E	lb.	.115	.1625
Statex 160	lb.	.11	.18
Vulcan 9	lb.	.115	.18

General-Purpose Furnace—GPF

Arogen GPF	lb.	.06	.1175
Statex G	lb.	.055	.1175
Sterling V	lb.	.06	.1175
V Non-staining	lb.	.06	.1175

High Modulus Furnace—HMF

Collocarb HMF	lb.	.045	.085
Continex HMF	lb.	$0.055	$0.095
Kosmos 40/Dixie 40	lb.	.055	.095
Modulex HMF	lb.	.0625	.12
Statex 93	lb.	.0575	.12
980	lb.	.047	.087
Sterling L, LL	lb.	.0625	.12

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

Semi-Reinforcing Furnace—SRF

Collocarb SRF	lb.	.042	.082
Continex SRF	lb.	.045	.085
Essex SRF	lb.	.0575	.115
Furnex	lb.	.0525	.115
Gastex	lb.	.0625	.125
Kosmos 20/Dixie 20	lb.	.045	.085
Pelletex, NS	lb.	.0575	.115
Sterling NS, S	lb.	.0575	.115
R	lb.	.0625	.125

Fine Thermal—FT

P-33	lb.	.0575	
Sterling FT	lb.	.0575	

Medium Thermal—MT

Sterling MT	lb.	.04	
Non-staining	lb.	.05	
Thermax	lb.	.04	
Stainless	lb.	.05	

Colors

Black

Iron oxides, comml	lb.	.1235	.135
BK—Lansco	lb.	.1275	.13
Williams	lb.	.145	
Lansco synthetic	lb.	.10	
Mapico	lb.	.1475	.15
Lampblack, comml	lb.	.16	.45
Superjet	lb.	.085	.12
Permanent Blue	lb.	.80	1.05
Stan-Tone	lb.	.45	1.20
Vansul masterbatch	lb.	.60	.65
Paste	lb.	.14	.15

Blue

Alkali Blue G, R	lb.	2.38	
C. P. Iron Blues	lb.	.52	.54
Du Pont	lb.	2.55	4.75
Filo	lb.	.28	
Heveatex pastes	lb.	.80	1.45
Lansco ultramarines	lb.	.25	.28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80	1.05
Stan-Tone Violet Blue			
D-4000	lb.	3.45	
4001	lb.	3.00	
4002	lb.	.90	
4900	lb.	1.97	2.15
Vansul masterbatch	lb.	.90	2.70

Brown

Filo	lb.	.13	
Iron oxides, comml	lb.	.1425	.145
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1575	.16
Sienna, burnt, comml	lb.	.0425	.155
Williams	lb.	.115	.1775
Raw, comml	lb.	.045	.1325
Williams	lb.	.08	.1725
Umber, burnt, comml	lb.	.06	.07
Williams	lb.	.0725	.085
Raw, comml	lb.	.0625	.07
Williams	lb.	.07	.0825
Williams, pure brown	lb.	.155	
Vandyke	lb.	.12	
Mapico Tan	lb.	.2325	.235
Metallic Brown	lb.	.05	.06
Vansul masterbatch	lb.	2.10	2.20

Green

Chrome	lb.	.19	.50
Green	lb.	.80	2.40
Oxide	lb.	.3925	1.10
Cyanamid	lb.	.42	.44
Green G	lb.	3.00	
Lincoln Green	lb.	5.30	6.60
G-4099, -6099	lb.	.4525	
GH-9869	lb.	1.10	1.25
9976	lb.	1.20	1.35
Du Pont	lb.	2.05	2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95	1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	
Stan-Tone			
D-5000	lb.	3.95	
5001	lb.	.82	
5400	lb.	1.45	
Vansul masterbatch	lb.	2.00	2.60

Orange

Cyanamid Permatons	lb.	1.50	1.56
Du Pont	lb.	2.25	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone			
Light orange D-7003	lb.	3.97	4.17
70 PCO3	lb.	2.48	2.76
Orange 70 PCO4	lb.	2.80	3.08
D-7004	lb.	4.23	4.43
Stan-Tone Orange D-7104	lb.	$1.85	$2.05
Vansul masterbatch	lb.	2.00	2.60

Red

Antimony trisulfide	lb.	.285	.315
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Brilliant Toning Red	lb.	1.95	
Cadmium red lithopones	lb.	2.21	3.77
Cadmolith	lb.	1.72	2.20
Cyanamid	lb.	.93	1.90
Naphthol Red, Scarlet	lb.	2.95	3.80
Du Pont	lb.	2.00	2.05
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml	lb.	.06	.13
Lansco synthetic	lb.	.1175	
Mapico	lb.	.1425	.145
Recco	lb.	.12	
Williams Red	lb.	.13	.1525
Monsanto Maroon 113	lb.	1.50	
61148	lb.	1.75	
Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Rub-Er-Red	lb.	.0975	
Stan-Tone			
D-2000	lb.	1.25	
2110, 2120, 2121	lb.	.98	
2200	lb.	1.47	
2500	lb.	1.90	
2600	lb.	4.60	
2601	lb.	1.60	
2700	lb.	1.75	
2800	lb.	1.90	
Light Red D-7005	lb.	4.68	4.88
D-7105	lb.	1.97	2.17
70 PCO5	lb.	3.00	3.28
Red D-7006	lb.	4.89	5.09
D-7106	lb.	2.20	2.40
70 PCO6	lb.	3.35	3.63
Vansul masterbatch	lb.	.95	3.30
Venetian	lb.	.04	.0675

White

Antimony oxide	lb.	.27	.285
Burgess Iceberg	ton	50.00	80.00
Cryptone BT	lb.	.10	.11
Permolith lithopone	lb.	.08	.087
Titanium pigments			
Horse Head Anatase	lb.	.255	.27
Rutile	lb.	.275	.29
Rayox LW	lb.	.195	.205
R-110	lb.	.215	.225
Ti-Cal	lb.	.075	.0825
Ti-Pure	lb.	.195	.225
Titanox A, AA, A-168	lb.	.255	.265
C-50	lb.	.1438	.1488
RA, -10, -50	lb.	.275	.285
RC	lb.	.0963	.1013
-HT, -HTX	lb.	.0963	.0988
Unitane	lb.	.255	.29
Zopaque Anatase	lb.	.245	.27
Rutile	lb.	.205	.29
Zinc oxide, comml	lb.	.145	.1825
Azo ZZZ-11, -44, -55	lb.	.145	.165
20% leaded	lb.	.1505	.1705
35% leaded	lb.	.155	.175
50% leaded	lb.	.1588	.1788
Eagle AA, lead free	lb.	.145	.155
5% leaded	lb.	.145	.155
35% leaded	lb.	.1513	.1613
50% leaded	lb.	.1538	.1638
Florence Green Seal	lb.	.1625	.1725
Red Seal	lb.	.1575	.1675
White Seal	lb.	.1675	.1775
Horsehead XX-4, -78	lb.	.145	.155
Kadox-15, -17, -72, -515	lb.	.145	.155
-25	lb.	.1675	.1775
Lehigh, 35% leaded	lb.	.1513	.1613
50% leaded	lb.	.1538	.1638
Protox-166, -167	lb.	.145	.155
St. Joe, lead free	lb.	.145	.175
Zinc sulfide, comml	lb.	.253	.263
Cryptone ZS	lb.	.253	.263

Yellow

Cadmium yellow lithopones	lb.	1.12	1.15
Cadmolith	lb.	1.12	1.20
Cyanamid Hansa Yellow	lb.	2.20	
Du Pont	lb.	2.25	
Filo	lb.	.16	
Iron oxide, comml	lb.	.0525	.1175
Lansco synthetic	lb.	.1075	
Mapico	lb.	.12	.1275
Williams	lb.	.115	.1225
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BYP-282	lb.	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone			
D-1100	lb.	2.55	
1101	lb.	.69	
Lemon 70 PCO1	lb.	1.77	2.19
D-7001	lb.	2.80	3.00
Medium yellow 70 PCO2	lb.	1.79	2.21
D-7002	lb.	2.98	3.18
Vansul masterbatch	lb.	.95	1.95
Williams Ocher	lb.	.0575	.06

Dusting Agents

Diatomaceous silica	ton	32.00	48.00
Extrud-o-Lube, conc.	gal.	1.33	1.69

Glycerized Liquid Lubricant, concentrated	gal.	$1.25	$1.63
Latex-Lube GR	lb.	0.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30	0.35
Lubrex	lb.	.25	.30
Mica, 160 Biotite	lb.	.065	.0725
Mesh	lb.	.08	.0875
325 Mesh	lb.	.0825	.09
Concord	lb.	.08	.09
Mineralite	ton	45.00	
Pyrax A	ton	14.50	15.00
W. A.	ton	17.00	17.50
Talc, comml.	ton	18.40	38.50
EM	ton	11.00	63.00
LS Silver	ton	29.25	
Nytals	ton	25.00	36.00
Sierra Sagger 7	ton	34.00	
White IR	ton	19.75	
III	ton	20.75	
Vanfre	gal.	2.00	

Extenders

BRS 700	lb.	.02	.036
BRT 7	lb.	.035	.036
Cumar Resins	lb.	.065	.17
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29	.36
Brown	lb.	.1425	.263
Neophax	lb.	.157	.268
White	lb.	.144	.285
G. B. Asphaltenes	lb.	.097	.177
Millex, W	lb.	.07	
Mineral Rubbers			
Black Diamond	ton	38.00	40.00
Hard Hydrocarbon	ton	46.50	48.50
Hydrocarbon MR	ton	45.00	55.00
Parmr	ton	21.00	29.00
T-MR Granulated	ton	47.50	50.00
Nuba No. 1, 2	lb.	.0575	.0625
3X	lb.	.0775	.0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.16	.2572
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.192	.2103
Stan-Shells	ton	35.00	73.00
Sublac Resin PX-5	lb.	.215	.235
Sundex 53	gal.	.12	
85	gal.	.1725	
Synthetic 100	lb.	.41	
Vistanex	lb.	.35	.475

Fillers, Inert

Agrashell flour	ton	50.00	74.00
Albacar	ton	55.00	75.00
Barytes, floated, white	ton	49.00	70.85
Off-color, domestic	ton	25.00	
No. 1	ton	55.00	77.50
2	ton	50.00	72.50
Sparmite	ton	95.00	117.00
Blanc fixe	ton	100.00	165.00
Burgess Iceberg	ton	50.00	80.00
Pigment #20	ton	35.00	60.00
#30	ton	37.00	60.00
HC-75	ton	12.00	30.00
-80	ton	14.00	32.00
WP #1	ton	11.00	16.00
Camel-Carb	ton	14.00	
-Tex	ton	22.00	
-Wite	ton	35.00	
Cary #200	ton	30.00	55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	
Clays			
A. F. D. Filler	ton	29.50	36.00
Aiken	ton	14.00	
Albacar	ton	50.00	55.00
Aluminum Flake, coarse	ton	25.50	28.50
Fine	ton	29.50	36.00
#5	ton	27.50	34.50
Champion	ton	14.50	
Crown	ton	14.00	33.00
Dixie	ton	14.50	
Franklin	ton	13.50	35.25
GK Soft Clay	ton	11.00	
Harwick	ton	15.50	55.50
Hi-White R	ton	14.50	19.50
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
McNamee	ton	14.50	
RX-43	ton	33.00	
Natka 1200	ton	13.00	
Par	ton	13.00	
Paragon	ton	14.50	19.50
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	14.50	19.50
Swanee	ton	12.50	
Windsor	ton	14.00	30.00
DC Silica	lb.	1.15	1.40
Diatomaceous silica	ton	32.00	48.00
Flocks			
Cotton, dark	lb.	.095	.135
Dyed	lb.	.55	.60
White	lb.	.13	.33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.22	2.46
Kalite	ton	52.50	67.50
Lithopone, comml.	lb.	$0.075	$0.085
Astrolith	lb.	.068	.0675
Eagle	lb.	.0725	.075
Permolith	lb.	.08	.0875
Sunolith	lb.	.075	.0825
Mica, 160 Biotite	lb.	.065	.0725
Mesh	lb.	.08	.0875
325 Mesh	lb.	.0825	.09
Concord	lb.	.08	.09
Millical	ton	38.00	53.00
Mineralite	ton	40.00	60.00
Non-Fer-Al	ton	35.00	50.00
Ohio Superspray lime	ton	16.50	
Pulverized limestone, Stonelite	ton	8.25	11.00
Purecal	ton	56.75	71.75
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Sawdust	ton	14.00	35.00
Silversheen Mica	lb.	.08	.09
StanWhite	ton	10.50	13.10
Super-White Silica	ton	25.00	46.50
Surfex	ton	37.50	52.50
MM	ton	42.00	57.00
Suspenso	ton	38.00	53.00
Ti-Cal	lb.	.0675	
Valron Estersil	lb.	2.00	2.25
Walnut shell flours	ton	50.00	84.00
Whiting, limestone			
Atomite	ton	32.50	35.00
Calcite	ton	23.00	
Calwhite	ton	20.00	27.00
-T	ton	23.00	
Duramite	ton	20.00	
Gamaco	ton	32.50	40.00
Keystone	ton	20.00	22.00
Laminar	ton	30.00	
No. 10 White	ton	11.00	16.50
Omya	ton	30.00	
BSH	ton	45.00	
Paxinosa	ton	14.50	22.50
Snowflake	ton	17.00	18.00
Witco	ton	13.00	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50	8.00
Flocks, Rayon, colored	lb.	.90	1.50
White	lb.	.75	1.25
Also see Flocks, under Fillers, Inert			
Paraflint RG and RGU Synthetic Wax	lb.	.15	.22
Rubber lacquer, clear	gal.	1.00	2.00
Shellacs, Angelo	lb.	.485	.7325
Vac Dry	lb.	.485	.57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15	.20
Wax, Bees	lb.	.68	.83
Carnauba	lb.	.57	1.13
Monten	lb.	.27	
No. 118, colors	gal.	.86	1.41
Neutral	gal.	.76	1.31
Van Wax	gal.	1.45	1.50

Latex Compounding Ingredients

Acintol D, DLR	lb.	.06	.075
FA #1	lb.	.065	.08
#2	lb.	.075	.09
Accelerator 552	lb.	2.25	
J-117, -302	lb.	1.00	1.15
-144	lb.	.15	.30
-307	lb.	1.10	1.25
-311	lb.	.60	.75
Aerosol, dry types	lb.	.65	.80
Liquid types	lb.	.40	.75
Alcogard 354	lb.	1.40	1.42
Alcogum AK-12	lb.	.12	.14
AN-6	lb.	.055	.06
-10	lb.	.09	.10
-25	lb.	.31	
PA-15	lb.	.16	
Alrosol	lb.	.41	
Amberex solutions	lb.	.1675	.18
Antifoam J-114	lb.	3.25	3.45
P-242	lb.	.24	.35
Antioxidant J-137, -140	lb.	.55	.70
-139, -293	lb.	1.45	1.60
-182	lb.	2.00	2.15
-186	lb.	1.40	1.55
2246	lb.	1.50	1.53
Anti Webbing Agent J-183	lb.	.75	.90
-297	lb.	.27	.40
Aquablak B	lb.	.0975	.1025
G	lb.	.12	.125
K	lb.	.12	.125
M	lb.	.105	.11
Aquarex D	lb.	.78	
G	lb.	.21	
L	lb.	.94	
MDL	lb.	.33	
ME	lb.	.80	
Aquarex NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.20	
Areskap 50	lb.	.30	.38
100, dry	lb.	.60	.72
Aresket 240	lb.	.30	.38
300, dry	lb.	.60	.72
Aresklene 375	lb.	.42	.57
Ben-A-Gels	lb.	.98	1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -40 -300	lb.	1.00	1.17
CW-12		$0.85	
-37	lb.	.70	
DC Antifoam A Compound	lb.	5.45	$6.65
B	lb.	.68	1.20
Emulsion	lb.	2.05	4.00
AF Emulsion	lb.	2.05	2.85
Compound 7	lb.	5.13	6.50
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
NDW	lb.	.215	.235
Dispersing Agents			
Blancol	lb.	.1525	.26
N	lb.	.155	.26
Darvan Nos. 1, 2, 3	lb.	.22	.30
Daxad 11, 21, 23, 27	lb.	.08	.30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50	.70
Igepal CO-630	lb.	.2875	.47
Igepon T-73	lb.	.285	.495
T-77	lb.	.45	.69
Indulins	lb.	.06	.08
Kreelons	lb.	.132	.155
Laurelton Oil	lb.	.18	
Leonil SA	lb.	.52	.65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225	.1425
N	lb.	.095	.105
Modicols	lb.	.17	.58
Nekal BA-75	lb.	.395	.54
BX-76	lb.	.63	.75
Nopco 1287	lb.	.155	.195
Orzan A	lb.	.0325	
S	lb.	.0425	
Pluronics	lb.	.335	.40
Polyfons	lb.	.08	.09
Sorapon SF-78	lb.	.28	.40
Tergitol NPX	lb.	.275	.3074
TMN	lb.	.2875	.32
7	lb.	.4125	.44
Trenamine W-30	lb.	.15	
W-40	lb.	.60	.75
Triton R-100	lb.	.12	.25
X-100, -102, -114	lb.	.255	.36
Dispersions			
Agebest 1293-22	lb.	1.90	2.00
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Shield Nos. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron Oxide, 60%	lb.	.40	
L.S.W.	lb.	1.50	
No. 305 Liquizinc	lb.	.30	.35
P-33	lb.	.35	
Rotax	lb.	.75	
Sulfur	lb.	.12	.30
No. 2	lb.	.14	.16
Telloy	lb.	3.00	
Tuads, Methyl	lb.	1.14	
Vulcacure NB	lb.	.45	
NS	lb.	.75	1.05
T.M.D.	lb.	1.14	
ZB, ZE, ZM	lb.	.85	.89
Vulcanizing, C group	lb.	.40	1.30
G group	lb.	.45	.90
N group	lb.	.40	1.00
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.04	
Ethyl, Methyl	lb.	1.04	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Stalite	lb.	.75	
Borden Arcco A-25, A-26, 716-30	lb.	.18	.19
555-40-R	lb.	.185	.205
620-32B	lb.	.20	.21
716-35	lb.	.17	.18
1041-21	lb.	.165	.175
Habuco Resin Nos. 502, 515, 523	lb.	.195	.20
503	lb.	.22	.225
504, 526	lb.	.19	.195
517	lb.	.175	.18
524	lb.	.155	.16
Resin A-2	lb.	.16	.25
P-370	lb.	.175	.25
X-210	lb.	.12	.22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Hyonic PE 250	lb.	.255	.295
Igepon T-43	lb.	.145	.35
T-51	lb.	.125	.285
-73	lb.	.285	.495
Ludox	lb.	.1675	.195
Marmix	lb.	.41	.48
Merac	lb.	.75	1.05
Micronex, colloidal	lb.	.06	.072
Modical S	lb.	.3084	.3284
VD	lb.	.1384	.1584
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD 101	lb.	.16	.26
Picco Latex Plasticizer A-12	lb.	.069	.096
Pliolite Latex 150, 190	lb.	.32	.41
170	lb.	.37	.46
Polyvinyl methyl ether	lb.	.25	.45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse D	lb.	.44	.65
S	lb.	.13	.25
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905	.975
30A	lb.	.245	.265

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All Classified Advertising Must Be Paid in Advance

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SITUATIONS OPEN

LATEX CHEMIST, GOOD BACKGROUND IN ALL PHASES OF compounding necessary. Submit complete education and work résumé along with salary requirements. All replies confidential. Laboratory located Metropolitan New York area. Address Box No. 2260, care of RUBBER WORLD.

AMERICAN-OWNED RUBBER FACTORY IN CARIBBEAN ISLAND PARADISE WILL START MANUFACTURING BICYCLE TIRES AND TUBES. IF YOU HAVE COMPLETE KNOWLEDGE COMPOUNDING, MAKING AND EQUIPMENT NEEDED, SEND FULL PARTICULARS TO BOX NO. 2257, CARE OF RUBBER WORLD. EXCELLENT LIVING CONDITIONS. THIS IS A CHOICE JOB.

ADVERTISING SPACE SALESMAN

Junior salesman needed for staff of national industrial publication serving the rubber industry. Chemical or rubber experience essential. Territory will include part of New York and New England. Send resume giving education, experience, marital status and salary requirement. Address Box No. 2258, care of RUBBER WORLD.

SITUATIONS OPEN (Cont'd.)

PRODUCTION MANAGER

PRECISION MOLDED GOODS MANUFACTURER LOOKING FOR well-qualified man to take charge of all production. Address Box No. 2262, care of RUBBER WORLD.

COMPOUNDER

NORTHERN OHIO PRECISION MOLDED GOODS MANUFACturing company looking for experienced compounder and qualified technical man. Address Box No. 2263, care of RUBBER WORLD.

SITUATIONS WANTED

MANUFACTURING EXECUTIVE, GRADUATE ENGINEER, AGE 36, Married. Proven success with 17 years' experience in factory management, product development, compounding, machinery design, and production trouble shooting. Aggressive and full of initiative. Cost reduction through modern industrial engineering techniques. Languages. Responsible position with progressive manufacturer desired. Address Box No. 2252, care of RUBBER WORLD.

PLANT MANAGER, 20 YEARS' DIVERSIFIED EXPERIENCE IN molded, extruded, and dipped goods. Chemically blown, and all types of solid products. Good technical background. Know all types of machinery, processes, quality control, and cost reduction. Have fine record in all phases of management, including personnel, labor relations, and sales organization. Must relocate for family health reasons. Far West, or Southwest preferred, but South or East acceptable. Address Box No. 2253, care of RUBBER WORLD.

3 *Opportunities for* ***Chemical Engineers or Chemists***

Production Supervisor — First Line

Rotating shift schedule. Opportunity for rapid advancement to other technical or managerial work. BS in ChE with 2 to 5 years' manufacturing experience in a rubber industry required.

Technical Service Expert

Marketing activity providing technical service to silicone rubber customers. Field and laboratory work on material specifications, application, development and technical rubber problems. BS in ChE or Chemistry. Technical experience in rubber or silicone fields.

Process Engineer

Opportunity to work with new silicone rubber products from pilot plant through commercial production. BS, MS in chemical engineering with approximately 5 years' related experience required.

Send detailed resume in confidence to: Mr. R. L. Clark, Employee Relations Mgr.

Silicone Products Department

GENERAL ELECTRIC

Waterford, New York

Sequestrene ST	lb.	$0.585 /	$0.615
Setsit #5	lb.	.75 /	1.05
D #9	lb.	.85 /	1.15
Stablex A	lb.	.80 /	1.10
B, G	lb.	.50 /	.95
K	lb.	.27 /	.35
P	lb.	.35 /	.50
T	lb.	.14 /	.22
Surfactol 13	lb.	.345 /	.36
Vult-Accel E	lb.	.85 /	.92
Webnix	lb.	1.50 /	2.50

Mold Lubricants

Acintol D	lb.	.06 /	.75
A-C Polyethylene	lb.	.30 /	.47
Alipal CO-433	lb.	.25 /	.45
CO-436	lb.	.22 /	.41
Aquarex Compounds	lb.	.21 /	.94
Carbowax 200, 300, 400	lb.	.22 /	.25
1500	lb.	.255 /	.2825
4000	lb.	.31 /	.32
6000	lb.	.35 /	.36
Castorwax	lb.	.3375/	.3575
Colite Concentrate	gal.	.90 /	1.15
D-Tak Dip #10	gal.	1.50	
DC Mold Release Fluid	lb.	3.14 /	4.75
Compound 4, 7	lb.	5.13 /	6.50
Emulsion 7	lb.	1.20 /	1.74
8, 35, 35A, 35B, 36	lb.	1.20 /	1.74
200 Fluid	lb.	3.14 /	4.75
ELA	lb.	.82	
FT Wax 200	lb.	.265 /	.42
300	lb.	.295 /	.45
Glycerized Liquid Lubricant, concentrated	gal.	1.25 /	1.63
Igepals	lb.	.2875	.74
Igepon AP-78	lb.	.44 /	.68
T-43	lb.	.145 /	.35
-51	lb.	.125 /	.285
-73	lb.	.285 /	.495
Lubrex	lb.	.27 /	.32
Lubri-Flo	gal.	10.00 /	12.05
Lustermold	lb.	.41	
L-41 Diethyl Silicone Oil	lb.	3.50	
Mold Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
MR-22	gal.	9.95 /	14.95
Para Lube	lb.	.046 /	.048
Paraflint RG and RGU Synthetic Wax	lb.	.15 /	.22
Plaskon 8406, 8407	lb.	.30 /	.37
8416, 8417	lb.	.35 /	.42
8429	lb.	.40 /	.47
Pluronics	lb.	.335 /	.44
Poly-Brite PE-200	lb.	.28 /	.42
600	lb.	.42 /	.58
Poly-Cone 125X	lb.	1.20 /	1.40
1000	lb.	.93 /	1.06
Polyglycol E series	lb.	.29 /	.42
RA-1, -2, -3	gal.	2.25 /	3.00
Rubber Glo	gal.	.94 /	.97
SM-33, -55, -61, -62	lb.	1.22 /	1.76
Soap, Hawkeye	lb.	1.35 /	1.45
Purity	lb.	.155 /	.165
Sodium stearate	lb.	.40	
Stoner's 700 series	gal.	1.20 /	1.25
800 series	gal.	1.26 /	1.70
900 series	gal.	1.55 /	2.55
A Series	gal.	1.80 /	4.50
Ucon 50-HB Series	lb.	.25 /	.375
Ulco	lb.	.12 /	.23
Vanfre	gal.	1.95 /	3.00

Odorants

Alamasks	lb.	.75 /	6.50
Coumarin	lb.	2.95 /	3.55
Curodex 19	lb.	4.75 /	5.05
188	lb.	5.75	
198	lb.	5.75	
Ethavan	lb.	6.75 /	7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rodo	lb.	4.00 /	5.50
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00 /	3.15

Plasticizers and Softeners

Acintol R	lb.	.065 /	.07
Adipol 2EH, 10A, XX	lb.	.40 /	.435
BCA	lb.	.43 /	.455
ODY	lb.	.43 /	.465
Admex 710	lb.	.325	
711	lb.	.345	
744	lb.	.40	
Aro Lene #1980	lb.	.10 /	.12
Baker AA Oil	lb.	.195 /	.24
Crystal O Oil	lb.	.21 /	.255
Processed oils	lb.	.215 /	.235
Bardol, 639	lb.	.0275/	.0375
B	lb.	.055 /	.065
Benzoflex 2-45	lb.	.26 /	.29
9-88	lb.	.27 /	.30
Bondogen	lb.	.555 /	.605
BRC-20	lb.	.022 /	.0245
22	lb.	.026 /	.0285
30	lb.	.0165/	.025
521	lb.	.023	
BRH 2	lb.	.0341/	.0351
BRS 700	lb.	.036	
BRT 7	lb.	.035 /	.036
BRV	lb.	.0625/	.065
Bunarex Liquid	lb.	.0425/	.0555
Resins	lb.	.065 /	.1225
Bunnatol G, S	lb.	.40 /	.505
Butac	lb.	.125 /	.135
Butyl stearate, comml	lb.	$0.255	
Binney & Smith	lb.	.23 /	$0.26
Harchem	lb.	.2525/	.3425
Kessoflex	lb.	.245 /	.275
Ohio-Apex	lb.	.245 /	.255
Butyl stearate—G. P.	lb.	.0125/	.02
R-100	lb.	.045 /	.0525
TT	lb.	.017 /	.02
Califlux G. P.	lb.	.015 /	.0225
R-100	lb.	.0475/	.0575
T-T	lb.	.019 /	.0295
510, 550	lb.	.0275/	.0375
Capryl alcohol, comml	lb.	.195 /	.235
Columbian Carbon	lb.	.195 /	.30
Harchem	lb.	.195 /	.30
Chlorowax 40	lb.	.1625/	.1825
70	lb.	.185 /	.245
S	lb.	.21 /	.27
Circo light	gal.	.17	
Circosol-2XH	gal.	.185	
Contogums	lb.	.0875/	.111
Cumar Resins	lb.	.065 /	.17
DBM (dibutyl-m-cresol) Darax	lb.	.32 /	.3475
DBP (dibutyl phthalate), comml	lb.	.30 /	.133
Darex	lb.	.30 /	.33
Eastman	lb.	.29 /	.335
Harflex 140	lb.	.30 /	.395
Harwick Std. Chem. Co.	lb.	.325 /	.385
Hatco	lb.	.30 /	.33
Monsanto	lb.	.30 /	.335
Naugatuck	lb.	.30 /	.33
Ohio-Apex	lb.	.30 /	.335
PX-104	lb.	.30 /	.33
Rubber Corp. of America	lb.	.30 /	.44
Sherwin-Williams	lb.	.30 /	.33
DBS (dibutylsebacate) comml	lb.	.66 /	.69
Eastman	lb.	.68 /	.71
Harflex 40	lb.	.655 /	.745
Hatco	lb.	.66 /	.685
Monoplex	lb.	.66 /	.675
Naugatuck	lb.	.665 /	.69
PX-404	lb.	.665 /	.69
DCP (dicaprylphthalate), comml	lb.	.295 /	.325
Harflex 180	lb.	.27 /	.36
Hatco	lb.	.295 /	.325
Monoplex	lb.	.30 /	.315
DDA (didecyladipate) Good-rite GP-236	lb.	.40 /	.55
Kessoflex	lb.	.40 /	.435
DDP (didecylphthalate) Good-rite GP-266	lb.	.295 /	.45
Hatco	lb.	.305 /	.435
Defoamer X-3	lb.	.355	
DIBA (diisobutyladipate) Darex	lb.	.4325/	.4625
Eastman	lb.	.41 /	.44
Ohio-Apex	lb.	.41 /	.445
DIDA (diisodecyladipate) Monsanto	lb.	.40 /	.435
RC	lb.	.40 /	.54
DIDP (diisodecylphthalate) Darex	lb.	.32 /	.35
Harchem	lb.	.29 /	.385
Monsanto	lb.	.29 /	.325
Ohio-Apex	lb.	.29 /	.325
PX-120	lb.	.305 /	.335
RC	lb.	.29 /	.43
Dielex B	lb.	.06	
Diethylene glycol, comml	lb.	.1525/	.1825
Wyandotte	lb.	.15 /	.165
Dinopol IDO	lb.	.285 /	.32
DIOA (diisooctyladipate) Harflex 220	lb.	.40 /	.495
Kessoflex	lb.	.40 /	.435
Naugatuck	lb.	.435 /	.465
PX-208	lb.	.425 /	.455
Rubber Corp. of America	lb.	.40 /	.54
DIOP (diisooctylphthalate), comml	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Eastman	lb.	.305 /	.335
Harflex 120	lb.	.28 /	.375
Hatco	lb.	.305 /	.335
Monsanto	lb.	.28 /	.315
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.28 /	.315
PX-108	lb.	.305 /	.335
Rubber Corp. of America	lb.	.28 /	.43
Sherwin-Williams	lb.	.32 /	.34
DIOS (diisooctylsebacate), comml	lb.	.61 /	.64
Rubber Corp. of America	lb.	.5925/	.70
DIOZ (diisooctylazelate) Cabflex	lb.	.48 /	.51
Dipolymer Oil	gal.	.33 /	.38
Dispersing Oil No. 10	lb.	.06 /	.0625
DNODA (di-n-octyl-n-decyl adipate), Monsanto	lb.	.40 /	.435
DOA (dioctyladipate), comml	lb.	.425 /	.455
Eastman	lb.	.40 /	.43
Good-rite GP-233	lb.	.40 /	.55
Harflex 250	lb.	.40 /	.495
Hatco	lb.	.435 /	.465
Monsanto	lb.	.40 /	.435
Naugatuck	lb.	.435 /	.465
PX-238	lb.	.425 /	.455
Rubber Corp. of America	lb.	.40 /	.54
DOP (dioctylphthalate), comml	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Eastman	lb.	.28 /	.315
Good-rite GP-261	lb.	.285 /	.44
Harflex 150	lb.	.28 /	.375
Hatco	lb.	.305 /	.335
DOP (comml.)			
Monsanto	lb.	$0.28 /	$0.315
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.28 /	.315
Polycizer 162	lb.	.28 /	.435
PX-138	lb.	.305 /	.335
Rubber Corp. of America	lb.	.28 /	.43
Sherwin-Williams	lb.	.305 /	.335
DOS (dioctylsebacate), comml		.61 /	.64
Eastman	lb.	.61 /	.64
Harflex 50	lb.	.5925/	.6825
Hatco	lb.	.61 /	.635
Monoplex	lb.	.61 /	.635
Naugatuck	lb.	.615 /	.64
PX-438	lb.	.615 /	.64
Rubber Corp. of America	lb.	.5925/	.70
DOZ (di-2-ethylhexyl azelate) Kessoflex	lb.	.46 /	.48
Drapex 3.2	lb.	.40 /	.54
Dutch Boy NL-A10 (DBP)	lb.	.30 /	.33
-A20 (DOP), A30 (DIOP)	lb.	.305 /	.335
-A54	lb.	.295 /	.325
-C20 (DOS)	lb.	.61 /	.63
-F21	lb.	.395 /	.425
-F31	lb.	.44 /	.47
-F41	lb.	.48 /	.51
Dutrex 6	lb.	.025 /	.035
Dymerex Resin	lb.	.135 /	.1475
Emulphor EL-719	lb.	.52 /	.73
Endor	lb.	.67	
Ethox	lb.	.43 /	.455
Ethylene glycol, comml	lb.	.135 /	.165
Wyandotte	lb.	.1325/	.1425
Flexol 3 GH	lb.	.44 /	.46
3 GO	lb.	.53 /	.55
4 GO	lb.	.325 /	.355
10-A	lb.	.425 /	.455
426	lb.	.27 /	.30
810, 810X, 10-10, 10-10X	lb.	.305 /	.335
TOF, A-26	lb.	.435 /	.465
Flexricin P-4	lb.	.3475/	.3625
P-6	lb.	.415 /	.43
P-8	lb.	.3475/	.3625
PG-16	lb.	.335 /	.35
Fortex	lb.	.125 /	.145
Fura-Tone NC 1008	lb.	.28	
1012	lb.	.46	
G. B. Asphaltic Flux	gal.	.097 /	.177
Naphthenic Neutrals	gal.	.125 /	.215
Process oil, light	lb.	.0275/	.0375
Medium	lb.	.0375/	.0475
Galex W-100	lb.	.155 /	.18
W-100 D	lb.	.1525/	.1775
Gilsowax B	lb.	.0975/	.11
Harchemex	lb.	.24 /	.345
Harflex 300	lb.	.58 /	.675
325	lb.	.4325/	.52
375	lb.	.7425/	.83
500	lb.	.315 /	.41
HB-20	lb.	.15 /	.17
-40	lb.	.19 /	.22
Heavy Resin Oil	lb.	.0225/	.0375
HSC-13	lb.	.25 /	.32
-39	lb.	.22 /	.29
Hycar 1312	lb.	.60	
Indonex	gal.	.13 /	.225
Kapsol	lb.	.33 /	.355
Kenflex A, L	lb.	.26 /	.27
B	lb.	.23 /	.24
N	lb.	.18 /	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.315 /	.325
-90	lb.	.40 /	.435
-140	lb.	.46 /	.485
-201	lb.	.58 /	.59
-220	lb.	.33 /	.365
-555	lb.	.59 /	.60
Kronisol	lb.	.33 /	.365
Kronitex AA, I, K-3, Mx	lb.	.325 /	.36
LX-685, -125, -135	lb.	.125 /	.135
Marvinol plasticizers	lb.	.28 /	.8825
Methox	lb.	.385 /	.41
Monoplex S-38	lb.	.215 /	.24
S-71	lb.	.45 /	.475
Morflex	lb.	.25 /	.65
Natac	lb.	.12 /	.13
Neoprene Peptizer P-12	lb.	1.05	
Nevillac	lb.	.31 /	.85
Neville R Resins	lb.	.145 /	.205
Nevinol	lb.	.24	
No. 1-D heavy oil	lb.	.065	
NP-10	lb.	.50 /	.53
ODA (octyldecyladipate) Good-rite GP-235	lb.	.40 /	.55
Kessoflex	lb.	.40 /	.435
RC	lb.	.40 /	.54
ODP (octyldecylphthalate) Good-rite GP-265	lb.	.29 /	.445
Hatco	lb.	.305 /	.335
Rubber Corp. of America	lb.	.285 /	.43
Ohopex Q-10	lb.	.28 /	.315
R-9	lb.	.3525/	.3775
Orthonitro benzophenol, comml	lb.	.13 /	.15
Palmalene	lb.	.15	
Panaflex BN-1	lb.	.185 /	.225
Panarez Resins	lb.	.09 /	.14
Para Flux, regular	gal.	.10 /	.2125
No. 2016	gal.	.165 /	.24
2332	gal.	.11	
4205	lb.	.1075/	.2125
Para Lube	lb.	.046 /	.048

SITUATIONS WANTED (Cont'd.)

CHEMIST—FACTORY SUPERVISOR WITH SUFFICIENT TECHnical background for research, developing, and testing. Wide experience on production of articles from natural and synthetics. Can handle labor and production. Address Box No. 2255, care of RUBBER WORLD.

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SUPERINTENDENT, AGE 44 YRS., 17 YRS. IN RUBBER INDUSTRY—10 yrs. General Plant Supt. Large Mechanical Rubber Goods Manufacturer. Duties covered all phases of operations, production, planning, labor relations, etc. Address Box No. 2259, care of RUBBER WORLD.

SALESMAN CALLING ON RUBBER PLANTS IN N. OHIO DEsires additional lines or products. Address Box No. 2261, care of RUBBER WORLD.

MACHINERY & SUPPLIES FOR SALE

SURPLUS EQUIPMENT
4—Blaw Knox 6' x 40' Horizontal Vulcanizers with quick-opening doors, 250# working pressure, ASME.
1—Bolling 3-roll Laboratory Calender, 8" x 16".
2—Royle #½ Extruders, complete.
1—Banbury Midget Mixer with 2 HP gear motor.
1—Farrel-Birmingham 3-roll Lab Calender, 6" x 12".
Address Box No. 2254, care of RUBBER WORLD.

FOR SALE: ALL IN STOCK: 1—Farrel 500/1500-HP Horiz. Reducer. 3—4' x 84" vert. Vulcanizers, quick-opening doors, ASME 120#, 6—465-gal. stainless Reactors, 150# W.P., 165# jkt. 5—Pfaudler 500-gallon glass-lined Reactors, 10—Baker-Perkins #17-200-gal. sigma-blade Mixers. PERRY EQUIPMENT CORP., 1424 North 6th Street, Philadelphia 22, Pa.

EXTRAORDINARY OPPORTUNITY
Battery of Brand NEW
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14"x30" Late Style, Top-Cap
RUBBER or PLASTIC MILLS
each one with uni-drive;
may be purchased individually
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STerling 8-4672
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USED MACHINERY FOR RUBBER AND PLASTICS

ALL SALES ON "AS IS, WHERE IS" BASIS FROM THE AKRON, OHIO, AND TRENTON, N. J., WAREHOUSES OF

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Mixing Mills	Pumping Units
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Calenders	Spreaders
Presses	Tubers
Spare Parts	Other Equipment

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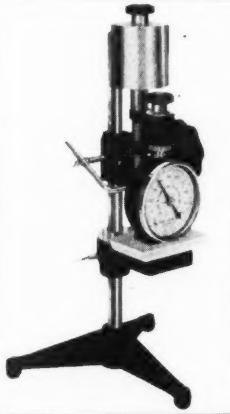

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ORIGINAL SHORE DUROMETER
ASTM D676 AND ASTM D1484

Various models for testing the entire range of hardness from elastomeric to rigid. Available in quadrant or round dial case. May be used free hand or on table top OPERATING STAND WITH DEAD WEIGHT (left).

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35 VAN WYCK EXP., JAMAICA 35, N.Y.

NEW CONCEPT

in calender and mill frame construction — frames of fabricated steel weldments — lifetime guarantee — new machines built in any size

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SHERMAN RUBBER MACHINERY CO.
DIVISION OF BOTWINIK BROTHERS OF MASS., INC.

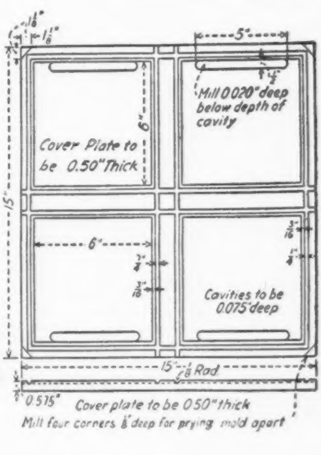
HOGGSON

"DUMBBELL" Test Strip Die D412(51T)

TOOLS, MOLDS, DIES
For Rubber Testing and Production

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB MOLD D15-55



HOGGSON & PETTIS MFG. CO., 141S Brewery St., New Haven 7, Conn.
Pac. Coast: H. M. Royal, Inc., Downey, Calif.

Para Lube Resins	lb.	$0.04	$0.045
Paradene Resins	lb.	.07	.08
Paraplex 5-B	lb.	.29	.3475
Al-111	lb.	.32	.3275
G-25	lb.	.76	.77
-40	lb.	.4825	.51
-50	lb.	.39	.4175
-53	lb.	.4325	.46
-60	lb.	.325	.35
-62	lb.	.345	.37
RG-7	lb.	.33	.335
-8	lb.	.505	.5125
-10	lb.	.52	.5275
Peptizer 620	lb.	.37	
Peptizer 640	lb.	.42	
Pepton 22	lb.	.83	.86
65	lb.	1.23	1.26
65-B	lb.	.83	.86
Philrich 5	gal.	.11	
Picco Resins	lb.	.1275	.22
480 Oilproof Series	lb.	.18	.23
Aromatic Plasticizers	lb.	.05	.065
Liquid Resin D-165 (Y)	lb.	.06	.075
(Z-3)	lb.	.07	.085
(Z-6)	lb.	.08	.095
S. O. S.	gal.	.29	.34
Piccocizers	lb.	.04	.055
Piccolastic Resins	lb.	.16	.25
Piccolyte Resins	lb.	.205	.245
Piccopale Resins	lb.	.12	.135
Piccovars	lb.	.165	.20
Piccovol	lb.	.025	.038
Pictar	gal.	.25	.30
Pigmentar	lb.	.046	.0634
Pigmentaroil	lb.	.046	.0634
Pitch, Burgundy, Sunny South	lb.	.1030	.1085
Plasticizers			
42	lb.	.34	.40
84	lb.	.27	.305
B	lb.	.35	.45
DP-520	lb.	.435	.455
MP	lb.	.035	.0755
MT-511	lb.	.6925	.7425
ODN	lb.	.35	.475
SC	lb.	.40	.515
Plastoflex #3	lb.	.52	.57
#520	lb.	.36	.435
DBE	lb.	.50	.55
MGB	lb.	.29	.37
SP-2	lb.	.43	.48
VS	lb.	.3575	.3975
Plastogen	lb.	.0875	.09
Plastone	lb.	.25	.32
Polycin 470	lb.	.325	.34
Polycizers	lb.	.28	.55
162	lb.	.285	.44
Polymel-C	lb.	.1775	.1875
D	lb.	.225	.235
D-TAC	lb.	.1975	.215
DX, C-130	lb.	.1375	.1475
Poly-Sperse AP-2	lb.	.23	.295
AP-300	lb.	.26	.325
LC-20	lb.	.26	.325
R-100	lb.	.17	.325
PT Pine Tars	lb.	.038	.0554
101 Pine Tar Oil	lb.	.038	.0554
Reogen	lb.	.1425	.145
Resin C pitch	lb.	.0225	.031
R6-3	lb.	.38	.40
Resinex 10, 25, 50, 110	lb.	.04	.045
70	lb.	.0325	.0375
85, 100	lb.	.035	.04
115	lb.	.0375	.0425
L-2, L-3, L-4, L-5	lb.	.0225	.03
Rosin Oil, Sunny South	gal.	.58	.76
RPA No. 2	lb.	.85	
3	lb.	.51	
Conc.	lb.	.85	
5	lb.	.68	
6	lb.	1.66	
RSN Flux	gal.	.10	.91
Rubber Oil B-5	lb.	.0225	.0355
Rubberol	lb.	.18	.2725
Santicizer 1-H	lb.	.50	.52
8	lb.	.44	.46
9	lb.	.42	.44
140	lb.	.325	.36
141	lb.	.34	.375
160	lb.	.265	.30
602	lb.	.285	
B-16	lb.	.4875	.4975
E-15	lb.	.52	.55
Santocizer	lb.	.4275	.4575
Sebacic acid, purified, comml.	lb.	.59	.65
Binney & Smith	lb.	.64	.76
C. P.- Binney & Smith	lb.	.72	.84
Harchem	lb.	.69	.89
Sherolatum Petroleum	lb.	.05	.10
Softener #20	gal.	.10	.20
Special Rubber Resin 100	lb.	.1675	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61	.635
Syn-Tac	gal.	.33	.35
Synthol	lb.	.17	.2625
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Triacetin	lb.	.365	.40
Tributyl phosphate	lb.	.50	.535
Tributyrin	lb.	.69	
Tricresyl phosphate, comml	lb.	.33	.36
Monsanto	lb.	.325	.36
Naugatuck	lb.	.33	.36
PX-917	lb.	.33	.36
Triphenyl phosphate, comml.	lb.	.39	.40
Monsanto	lb.	.39	.40
Turgum S	lb.	.1075	.1175
SB	lb.	.0675	.0775
Turpol NC 1200	lb.	$0.61	$0.70
Tysonite	lb.	.3025	.305
United	gal.	.69	1.20
X-1 Resinous Oil	lb.	.0225	.0325

Reclaiming Oils

Acintol C, P	lb.	.02	.03
Bardol, 639	lb.	.0275	.0375
B	lb.	.055	.065
BRH 2	lb.	.0213	.0351
BRT 3	lb.	.02	.031
4	lb.	.02	.031
7	lb.	.035	.036
BRV	lb.	.0625	.065
Burco-RA	lb.	.053	.0805
BWH-1	lb.	.16	.18
Dipolymer Oil	gal.	.33	.43
Dispersing Oil No. 10	lb.	.06	.0625
G. B. Oils	gal.	.115	.275
Heavy Resin Oil	lb.	.0225	.0375
LX-572	gal.	.27	.32
-759	gal.	.1375	
-777, -809, -859	gal.	.23	.33
-869	gal.	.33	.43
-871	gal.	.34	.44
No. 3186	gal.	.28	.295
Picco 6535	gal.	.25	.30
C-33	gal.	.215	.315
-42	gal.	.23	.33
D-4	gal.	.27	.37
E-5	gal.	.25	.35
Q-Oil	gal.	.286	.36
PT 101 Pine Tar Oil	lb.	.038	.0554
Reclaiming Oil #3186	gal.	.28	.385
-G	gal.	.25	.365
4039-M	gal.	.3275	.3975
-Y	gal.	.30	.37
RR-10	lb.	.37	
S. R. O.	lb.	.015	.0225
X-1 Resinous Oil	lb.	.0225	.0325

Reinforcers, Other Than Carbon Black

Angelo Shellacs	lb.	.485	.7325
Borden, Chem. Div.			
Arcco 978-42B	lb.	.18	.19
1073-18B	lb.	.135	.145
1294-36B	lb.	.115	.125
1301-12B	lb.	.15	.16
BRC-20	lb.	.0235	.0245
22	lb.	.026	.0285
30	lb.	.0165	.025
521	lb.	.023	
Bunarex Resins	lb.	.065	.1225
Cab-o-sil	lb.	.67	.85
Calcene CO	ton	105.00	
NC	ton	80.00	100.00
TM	ton	82.50	102.50
Calco S. A.	lb.	.85	.88
Clays			
Aiken	ton	14.00	
Aluminum Flake	ton	22.25	60.00
Buca	ton	45.00	
Burgess Iceberg	ton	50.00	80.00
Icecap K	ton	65.00	90.00
Pigment #20	ton	35.00	60.00
#30	ton	37.00	60.00
Catalpo	ton	35.00	
Crown	ton	14.00	33.00
Dixie	ton	14.50	
Franklin	ton	13.50	35.25
L. G. B.	ton	17.50	
McNamee	ton	14.50	
Par	ton	15.00	
Paragon	ton	14.50	33.00
Pigment No. 33	ton	37.00	
Polyfil C	ton	25.00	
Recco	ton	14.00	
Suprex	ton	14.50	33.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00	30.00
Witco No. 1	ton	14.00	30.00
No. 2	ton	13.50	30.00
Clearcarb	lb.	.1175	.1255
Cumar Resins	lb.	.065	.17
Darex Resins	lb.	.42	.49
DC Silica	lb.	1.15	1.40
Diatomaceous silica	ton	32.00	48.00
Good-rite 2007		.36	.38
2057		.30	.31
K Series Polymers	lb.	.15	.37
233	lb.	.08	.095
X303	lb.	.40	.45
Hi-Sil 233	lb.	.08	.095
X303	lb.	.40	.45
Hycar 2001	lb.	.55	
2007	lb.	.39	
Indulins	lb.	.06	.08
Kralac A-EP	lb.	.43	.54
Laminar	ton	30.00	
Magnesium carbonate, Marinco CL	lb.	.105	.135
Marbon Resins	lb.	.36	.43
Multifex MM	ton	117.50	137.50
Super	ton	167.50	187.50
Neville Resins			
465	lb.	.075	.08
LX-509	lb.	.33	.35
Nebony	lb.	.045	.05
Paradene	lb.	.07	.08
R	lb.	.145	.205
Para Resins 2457	lb.	.04	.045
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.1275	.22
Piccolyte Resins	lb.	.205	.275
Piccoumaron Resins	lb.	.07	.19
Piccovars	lb.	.145	.20
Pliolite NR types	lb.	$0.98	$1.33
S-3	lb.	.42	.49
S-6	lb.	.36	.43
-6B	lb.	.36	.43
E	lb.	.36	.43
Plio-Tuf G85C	lb.	.52	.59
Purecal M	ton	56.75	71.75
SC, T	ton	110.00	125.00
U	ton	120.00	135.00
R-B-H 510	lb.	.15	.22
Resinex	lb.	.0375	.0525
Rubber Resin LM-4	lb.	.28	.35
Silene EF	ton	110.00	130.00
L	lb.	.0575	.0675
Silvacons	ton	55.00	85.00
Transphalt	lb.	.0375	.0525
Witcarb P	ton	117.50	153.50
R	ton	127.50	163.50
Regular	ton	60.00	96.00
Zeolex 23	lb.	.055	.06
Zinc oxide, commercial†	lb.	.135	.1775

Retarders

Benzoic acid TBAO-2	lb.	.44	
E-S-E-N	lb.	.37	.39
Good-rite Vultrol	lb.	.62	.66
R-17 Resin	lb.	.1075	.36
Retarder ASA	lb.	.57	
J	lb.	.68	.73
PD	lb.	.39	.41
W	lb.	.46	
Retardex	lb.	.47	.50
Thionex	lb.	1.14	
Wiltrol P	lb.	.39	.41

Solvents

Bondogen	lb.	.555	.605
Butyrolactone	lb.	.60	.65
Cosol #1	gal.	.37	.43
#2	gal.	.42	.48
Dichloro Pentanes	lb.	.04	.07
Dipentene DD, Sunny South	gal.	.42	.63
Ethylene dichloride, comml.	lb.	.09	.122
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27	.32
-748	gal.	.16	.23
Methyl-2-pyrrolidone	lb.	.75	.80
Neville Nos. 100, 104	gal.	.52	.60
106	gal.	.38	.46
Nevsolv H, 200	gal.	.19	.29
HF, T, 30	gal.	.24	.34
Penetrell	gal.	.42	.63
Picco Hi-Solv Solvents	gal.	.16	.48
Pine Oil DD, Sunny South	lb.	.15	
Skellysolve-B	gal.	.17	
-H	gal.	.148	
-R, -V	gal.	.139	
-C	gal.	.162	
Stauffer Carbon Disulfide	lb.	.0525	.085
Tetrachloride	lb.	.0825	.475

Tackifiers

Acintol R	lb.	.065	.07
Bardol, 639	lb.	.0275	.0375
Borden, Arcco			
A25, A26, 716-30	lb.	.18	.19
555-40R	lb.	.185	.205
620-32B	lb.	.20	.21
716-35	lb.	.17	.18
1041-21	lb.	.165	.175
BRH 2	lb.	.0213	.0351
Bunarex Resins	lb.	.065	.1225
Chlorowax 70	lb.	.18	.24
Contogums	lb.	.0875	.11
Cumar Resins	lb.	.065	.17
Galex W-100	lb.	.155	.17
W-100D	lb.	.1525	.1625
Indopol H-35	gal.	.65	.84
H-50	gal.	.70	.89
-100	gal.	.85	1.08
-300	gal.	1.00	1.24
-1500	gal.	1.48	
L-10	gal.	.40	.59
-50	gal.	.45	.64
-100	gal.	.55	.74
Kenflex resins	lb.	.18	.27
Koresin	lb.	.90	1.10
Natac	lb.	.12	.13
Nevindene	lb.	.15	.18
Picco Resins	lb.	.1275	.22
Piccolastic Resins	lb.	.1855	.34
Piccolyte Resins	lb.	.185	.25
Piccopale Resins	lb.	.089	.13
Piccoumaron Resins	lb.	.07	.185
R-B-H 510	lb.	.15	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.17	.2625
United	gal.	.69	1.20

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Dodecenyl succinic anhydride	lb.	.75	.76
HMDA-Carbamate	lb.	4.50	4.90
Ko-Blend I. S.	lb.	.39	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525	.38
Maglite D, K	lb.	.235	.305
M	lb.	.2675	.33
Marmag	lb.	.2225	.2725
PSD 85	lb.	.37	.50

(*Continued on page 310*)

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McNEIL ELECTRO-MECHANICAL PRESS—MODEL 275-18-72, Serial #668-7118. 42" x 80" Single Opening—new platens installed in July, 1957. A-1 Condition. Also other rubber machinery items for sale. THE BUXBAUM CO., CANTON, OHIO.

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11-80, 100, 200, 112-3 Triols	lb.	$0.255	
11-300	lb.	.265	
11-400	lb.	.325	
Acrylonitrile	lb.	.27	
Butadiene	lb.	.15	
Dow Styrene N99, H99	lb.	.205	
RG	lb.	.17	
Vinyltoluene	lb.	.17	
EGD	lb.	1.75	/ $2.00
Hylene M	lb.	1.75	/ 3.25
M-50	lb.	1.00	/ 2.50
T	lb.	.95	/ 2.50
TM	lb.	.80	/ 2.35
-65	lb.	.85	/ 2.40
Isobutylene	gal.	.38	
Isoprene	lb.	.25	
Mondur-C	lb.	1.05	
Monomer MG-1	lb.	1.00	/ 1.25
-S	lb.	.85	
MPL	lb.	1.75	/ 2.00
Multron R-2	lb.	.54	
P200	lb.	.23	
Rohm & Haas ethyl acrylate	lb.	.34	/ .36
Glacial methacrylic acid	lb.	.45	/ .47
Methyl acrylate	lb.	.37	/ .39
Methacrylate	lb.	.29	/ .31

Shortstops

DDM	lb.	.88	/ .915
Mercaptan 174	lb.	.38	/ .50
Sharstop	lb.	.33	/ .37
268	lb.	.52	/ .53
Tecquinol	lb.	.825	/ .845
Thiostop K	lb.	.50	/ .53
N	lb.	.38	/ .47
Vulnapol KM	lb.	.52	/ .55
NM	lb.	.38	/ .42
Wingstop B	lb.	.38	

Acrylic Types

Acrylon BA-15	lb.		1.25[a]
EA-5	lb.		1.00[a]
Hycar 4021		1.34[c]	/ 1.35[c]

Latices

Hycar 2600X30, 2600X39, 2601	lb.	.50	/ .56

Fluorocarbon Types

Kel-F Elastomer	lb.	15.00	/ 16.00
5500, 820 (Latex)	lb.	15.00	/ 17.15
Viton A, AHV	lb.	15.00	

Isobutylene Types

Enjay Butyl 035, 150, 215, 065 217, 218,		.23[a]
325, 165, 268, 365		.24[a]
Hycar 2202	.65[c]	/ .75[c]
Polysar Butyl 100, 200, 300, 400		.245[c]
101		.2775[a]
301		.255[c]
Vistanex LM		.45[a]
MM		.35[a]

Neoprene Types (CR)

Neoprene Type AC, AD, CG		.55[a]
GN, GN-A, WX		.41[a]
GRT, S		.42[a]
KNR		.75[a]
W, WHV		.39[a]
WRT		.45[a]

Latices

Neoprene Latex 571, 842-A		.37[a]
572		.39[a]
60, 601-A		.40[a]
635		.41[a]
650	.42[a]	/ .53[a]
735, 736		.38[a]
750	.39[a]	/ .50[a]
950		.47[a]

Nitrile Types

Butaprene NF		.49[b]
NH		.65[b]
NL		.50[b]
NXM		.58[b]
Chemigum N1		.64[b]
N3 N5		.58[b]
N6, N-6B, N7, N8		.50[b]
N600		.50[b]
Hycar 1001, 1041	.58[c]	/ .59[c]
1002, 1042, 1043, 1052, 1053, 1312	.50[c]	/ .51[c]
1014	.60[c]	/ .61[c]
1072	.64[c]	/ .65[c]
1411	.62[c]	/ .63[c]
1432, 1441	.59[c]	/ .60[c]
Paracril AJ		.485[c]
B, BJ, BJLT, BLT		.51[c]
C, CLT		.59[c]
CV		.60[c]
D		.65[c]
18-80		.60[c]
Polysar Krynac 800, 802, 803		.50[c]
801		.58[c]

Latices

Butaprene N-300		$0.46[b]
N-400, N-401		.54[b]
Chemigum 200		.49[b]
235 CHS, 236		.54[b]
245 B, 245 CHS, 246, 247, 248		.46[b]
Hycar 1512, 1552, 1562, 1577	$0.46[c]	/ .52[c]
1551, 1561, 1571	.54[c]	/ .60[c]
1852	.46[c]	/ .52[c]
Nitrex 2612, 2614		.46[a]
2615		.51[a]

Polyethylene Type

Hypalon 20, 30	lb.	.70

Polysulfide Types

Thiokol LP-2, -3, -31, -32, -33		.96[a]
-8		1.35[a]
-205		4.00[a]
Type-A		.50[a]
FA		.69[a]
ST		1.25[a]

Latices

Thiokol Latex (dry wt.)		
Type MX		.80[a]
WD-2		1.25[a]
-6	.80[a]	/ 1.25[a]

Silicone Types

GE (compounded)	2.29[c]	/ 4.90[c]
Silicone gum (not compounded)	3.85[c]	/ 4.55[c]
Silastic (compounded)	2.95[b]	/ 3.50[b]
(Partly compounded)	3.15[b]	/ 3.60[b]
(Uncompounded)	4.05[b]	/ 4.35[b]
LS-53	22.00[b]	
Union Carbide (compounds)	2.35[b]	/ 3.20[b]
(Gums)	3.85[b]	/ 4.25[b]

Styrene Types

Hot SBR†

Ameripol 1000, 1001, 1006, 1007	.241[c]	/ .247[c]
1006 Crumb	.2475[c]	/ .2535[c]
1002	.2435[c]	/ .2495[c]
1009	.2475[c]	/ .2535[c]
1011	.2475[c]	/ .2610[c]
1012	.2425[c]	/ .2485[c]
Crumb	.254[c]	/ .26[c]
1013	.25[c]	/ .2560[c]
ASRC 1001, 1004, 1006, 1009	.241[c]	/ .2475[c]
1018		.270[c]
1019		.265[c]
FR-S 1000, 1001, 1004, 1006	.241[c]	/ .247[c]
1009	.2475[c]	/ .2535[c]
1010	.26[c]	/ .266[c]
1012	.2425[c]	/ .2485[c]
1013	.25[c]	/ .256[c]
1014	.281[c]	/ .287[c]
1015	.291[c]	/ .297[c]
Naugapol 1016, 1019		.265[b]
1018		.27[b]
1021		.30[b]
1022		.28[b]
1023		.285[b]
Philprene 1000, 1001, 1006		.241[b]
1009		.2475[b]
1010		.26[b]
1018		.27[b]
1019		.265[b]
Plioflex 1006		.241[c]
Polysar S, S-50		.241[c]
S-X-371		.255[c]
S-1001, -1006, -1013		.23[a]
-1002, -1011		.2325[a]
-1009		.24[a]
Synpol 1000, 1001, 1006, 1007, 1061		.241
1002		.2435[b]
1012		.2425[b]
1009		.2475[b]
1013		.25[b]

Hot SBR Black Masterbatch

Philprene 1100		.194
1104		.190[b]
S-1100		.185[a]

Cold SBR

Ameripol 1500, 1501, 1502	.241[c]	/ .247[c]
ASRC 1500, 1502		.241[c]
1503		.2625[c]
Copo 1500, 1502	.241[c]	/ .247[c]
1505	.261[c]	/ .267[c]
FR-S 1500, 1502		.247[c]
Naugapol 1503		.2625[b]
1504		.295[b]
Philprene 1500, 1502		$0.241[b]
1503		.2625[b]
Plioflex 1500, 1502		.241[c]
Polysar Kryflex 200		.251[c]
SS-250, SS-250-Flake		.2875[c]
Krylene, NS		.241[a]
S-1500, S-1502-S		.23[a]
S-1506		.25[a]
Synpol 1500, 1502, 1551		.241[b]

Cold SBR Black Masterbatch

Baytown 1600, 1601, 1602		.193[b]
Philprene 1600, 1601		.193[b]
1605		.19[b]
S-1600, -1601, -1602		.1825[a]

Cold SBR Oil Masterbatch

Ameripol 1703	$0.206[c]	/ .212[c]
1705	.2035[c]	/ .2095[c]
1707, 1708	.191[c]	/ .197[c]
1710, 1712	.1885[c]	/ .1945[c]
ASRC 1703		.206[c]
1708		.191[c]
Copo 1712	.1885[c]	/ .1945[c]
1773	.206[c]	/ .212[c]
1778	.191[c]	/ .197[c]
FR-S 1703	.206[c]	/ .212[c]
1705	.2035[c]	/ .2095[c]
1712	.1885[c]	/ .1945[c]
Philprene 1703		.206[b]
1706		.203[b]
1708		.191[b]
1712		.1885[b]
Plioflex 1703, 1773		.206[c]
1710, 1712		.1885[c]
1778		.191[c]
Polysar Krynol 65		.1885[c]
652		.191[c]
S-1703		.195[a]
-1706		.1925[b]
-1707		.18[a]
-1709, -1712		.1775[a]
Synpol 1703		.206[b]
1707, 1708		.191[b]
1711		.19[b]
1712		.1885[b]

Hot SBR Latices

FR-S 2000, 2001	.2725[c]	/ .3425[c]
2002, 2003, 2004	.35[c]	/ .36[c]
2006	.29[c]	/ .382[c]
Naugatex 2000, 2001, 2006		.263[a]
2002		.288[a]
2005		.30[a]
Pliolite Latex 2000, 2001		.2825[c]
2076		.295[c]
Polysar Latex II		.29[c]
IV		.2775
S-2000		.2275[a]
2006		.215[a]

Cold SBR Oil-Black Masterbatch

Baytown 1801		.176[b]
Philprene 1803		.174[b]
S-1803		.165[a]
-1804		.175[a]

Cold SBR Latex

Copo 2101, 2108	.30[c]	/ .4025[c]
2102, 2105, 2110	.32[c]	/ .3725[c]
FR-S 2105		.366[c]
Naugatex 2101		.285[a]
2105		.312[a]
X-767		.323[a]
Polysar Latex 721		.32[c]
Pliolite Latex 2101		.30[c]
2105, 2107		.32[c]
2108		.30[c]
S-2101		.225[a]
-2105		.31[a]
-2107		.32[a]

Cold BR Latex‡

Pliolite Latex 2104		.325[c]

[a] Freight extra.
[b] Minimum freight allowed.
[c] Freight prepaid.
* Prices are per pound carload or tank-car dry weight unless otherwise specified.
†SBR—Styrene-butadiene rubber.
‡BR—Butadiene rubber.

Compounding Ingredients

(Continued from page 308)

Red Lead (*See Accelerator-Activators, Inorganic*)

Sulfasan R	lb.	$1.55	/ $1.57
Sulfur flour, comml.	100 lbs.	2.55	/ 3.30
1018	lb.	.12	/ .1575
Aero	100 lbs.	2.40	/ 7.75
Crystex	lb.	.195	/ .23
Insoluble 60	lb.	.125	/ .13
Rubbermakers	100 lbs.	2.65	/ 4.55
Stauffer	lb.	.0265	/ .054
Telloy	lb.	2.75	
VA-7	lb.	.50	/ .60
Vandex	lb.	7.50	
Vultac No. 2	lb.	.47	/ .74
3	lb.	.51	/ .78

White lead silicate (*See Accelerator-Activators, Inorganic*)

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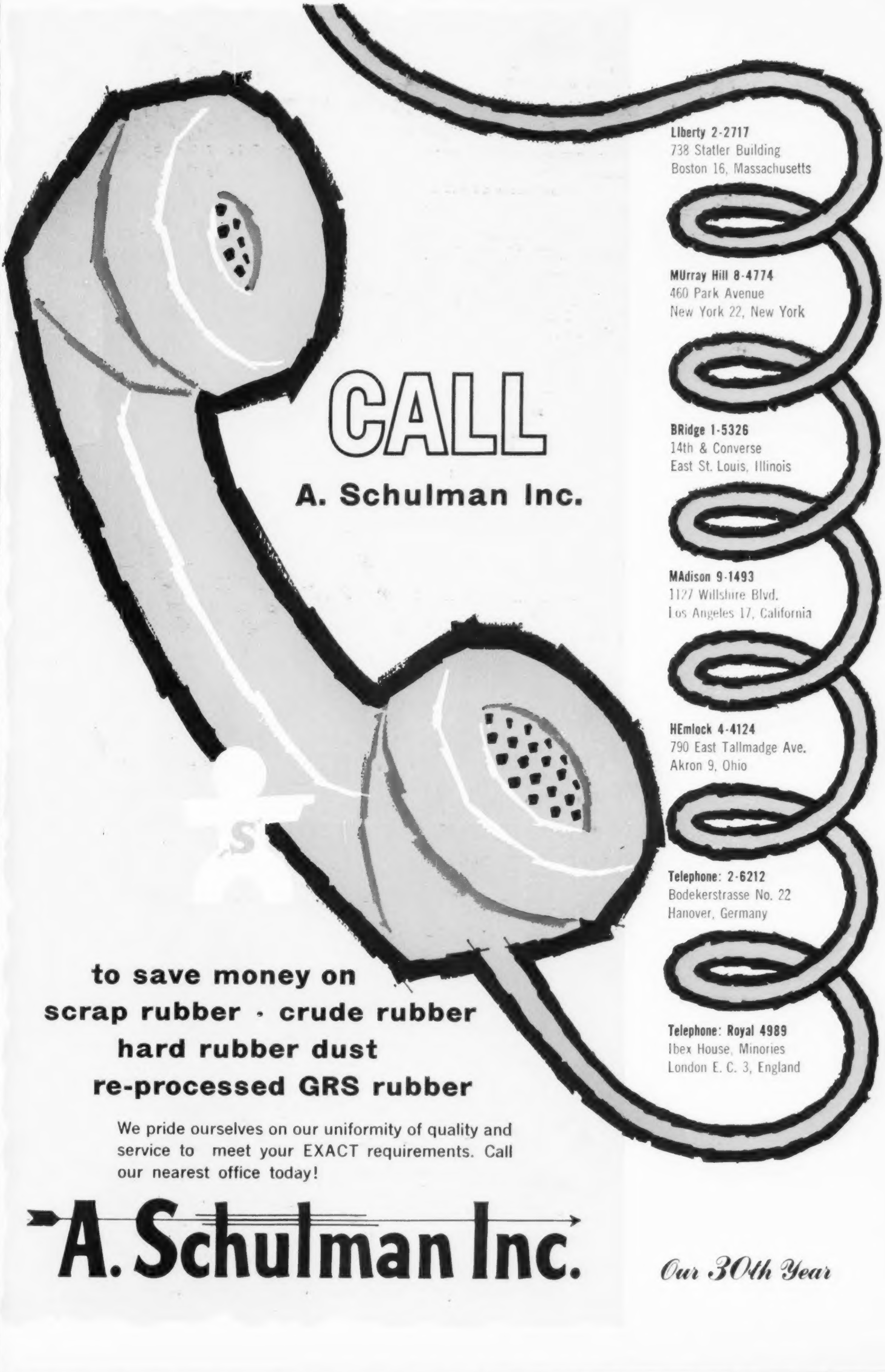
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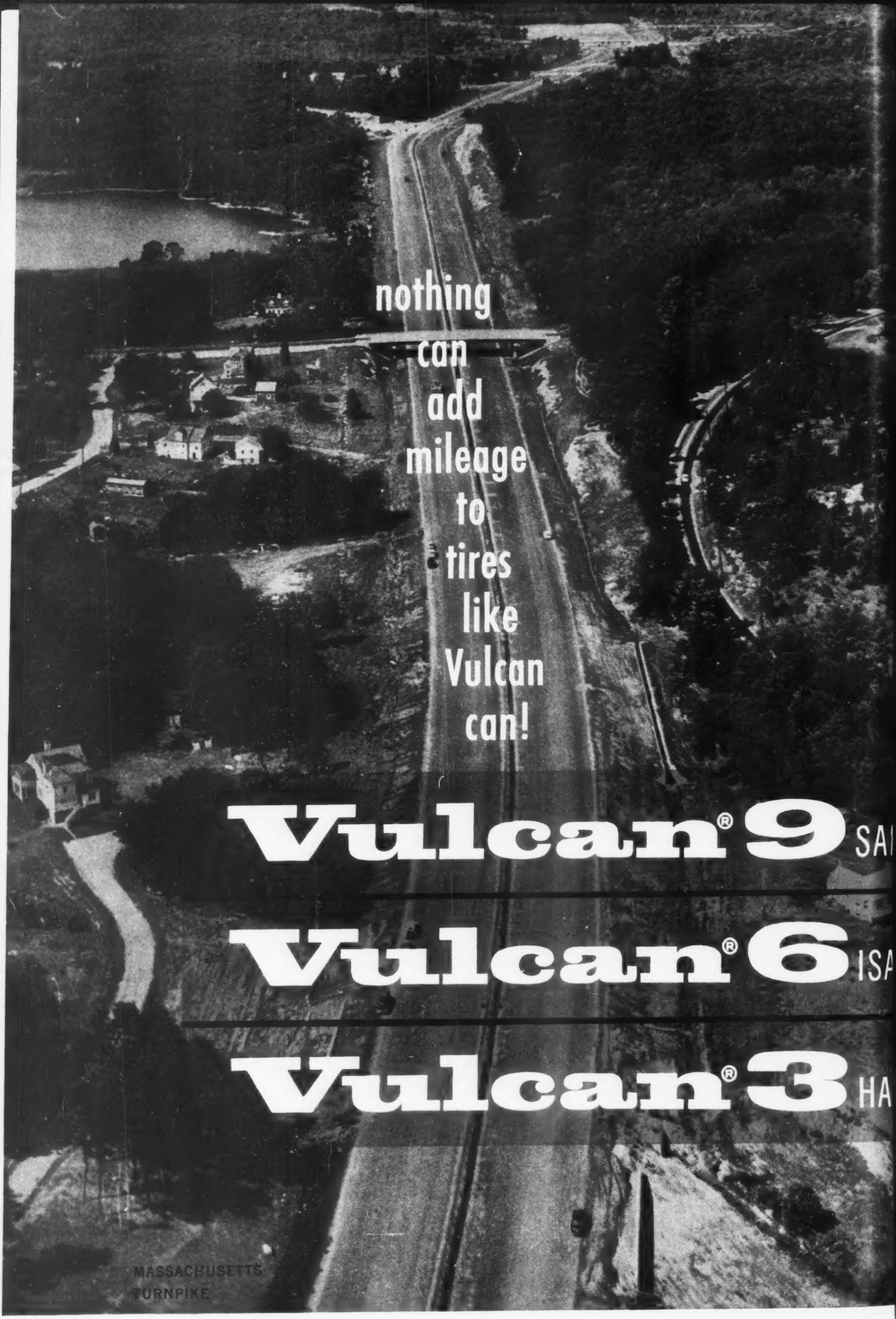
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